ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

APRIL 1953

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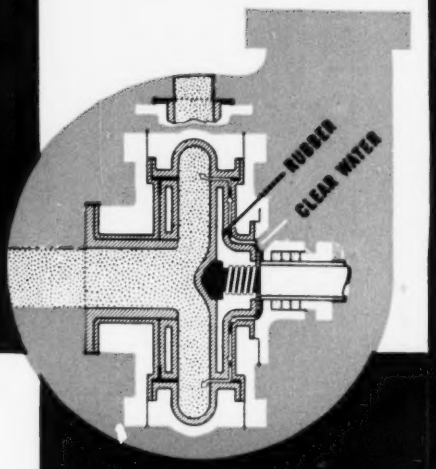
FOUNDED 1866

GREATER BUTTE ORE PRODUCTION NEARS 10,000-TON DAILY RATE . . p. 77

Also A Three-Star Iron-Ore Feature

★ Cyclones Treat Iron Ore . . . . . p. 86
★ Bethlehem's New Marmora Mine . . . p. 95
★ Steep Rock's New Mines . . . . . p. 82

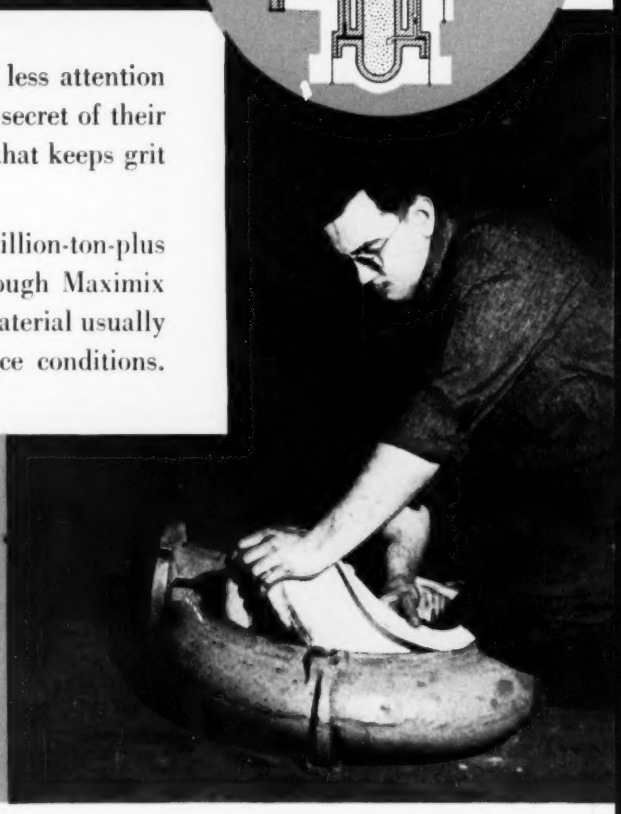
How Hydroseals cut down maintenance costs

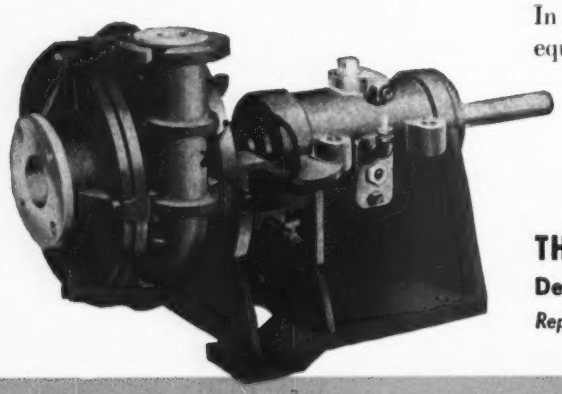


For one thing, Hydroseal Pumps need less attention than most abrasives-handling pumps. Part of the secret of their endurance is the exclusive Hydrosealing feature that keeps grit from enlarging critical clearances.

Another reason why Hydroseals often turn in million-ton-plus pumping records without repairs is the use of tough Maximix Rubber for parts in contact with abrasives. This material usually outlasts metal 4 to 6 times under similar service conditions.

When Hydroseals do need replacement parts, you can make the changes easily and quickly in the field. Shell liners, for example, are moulded so that they slip into place like the inner tube of a tire. Other parts are also designed for rapid assembly, and no cementing or vulcanizing is needed. Matching machined surfaces give a positive means for fast, accurate reassembly. This all adds up to less downtime.



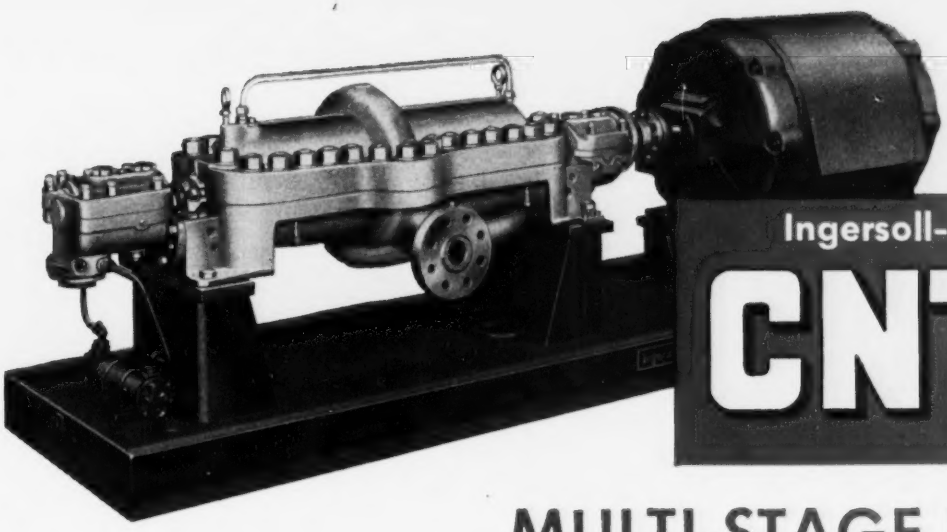


In addition, Maximix Rubber Parts cost less than equivalent metal parts. They also weigh 80% less, and are thus easier to handle and cheaper to ship. If you want to cut pumping costs, find out more about Hydroseals. Write today for our latest catalog.

THE ALLEN-SHERMAN-HOFF PUMP CO.
Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.
Representatives throughout the World

HYDROSEAL SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

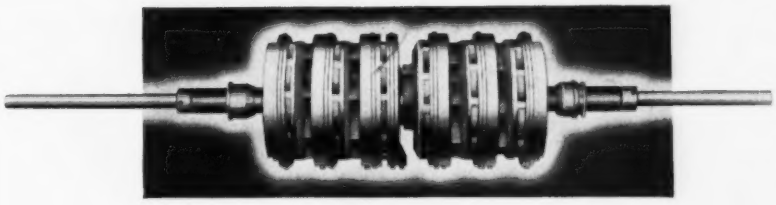
HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD



Ingersoll-Rand

CNTA

MULTI-STAGE PUMPS



extend the advantages of the

UNIT-TYPE ROTOR ASSEMBLY

HIGHER SUSTAINED EFFICIENCY

Greater simplicity of design, with precision-matched impellers and channel rings, permits unusually high efficiency which is sustained throughout years of operation.

GREATER DEPENDABILITY

Radial balance with multiple-volute design and axial balance with opposed impeller grouping, assure long trouble-free operation. The smooth-bore, symmetrical outer casing eliminates any possibility of distortion under high temperature operation.

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Entire rotor assembly can be removed from the casing as a single, compact unit, without disturbing piping connections. There are no ring fits to align on replacement of the rotor assembly.

to your medium pressure applications

• With the completely re-designed line of CNTA multi-stage pumps, Ingersoll-Rand offers a new high in performance, efficiency, dependability and economy—for medium-pressure boiler feed, mine dewatering, marine, petro-chemical and general hydraulic services.

The advanced design Unit-Type rotor assembly, with impellers and channel rings mounted on a single, heavy-duty shaft and with a smooth-bore outer casing, is the same type as that used by Ingersoll-Rand in the high-pressure CHTA and HMTA lines. The result of this modern construction is a dependable, simpler and more rugged unit that requires minimum attention and maintenance.

CNTA pumps are multi-stage, horizontally split units, with single-suction impeller groups placed back-to-back to eliminate hydraulic thrust. They are available in 4, 6 and 8 stages for pressures from 100 to 800 psi, in capacities from 50 to 700 gpm.

Your I-R representative will be glad to give you the *complete story*.

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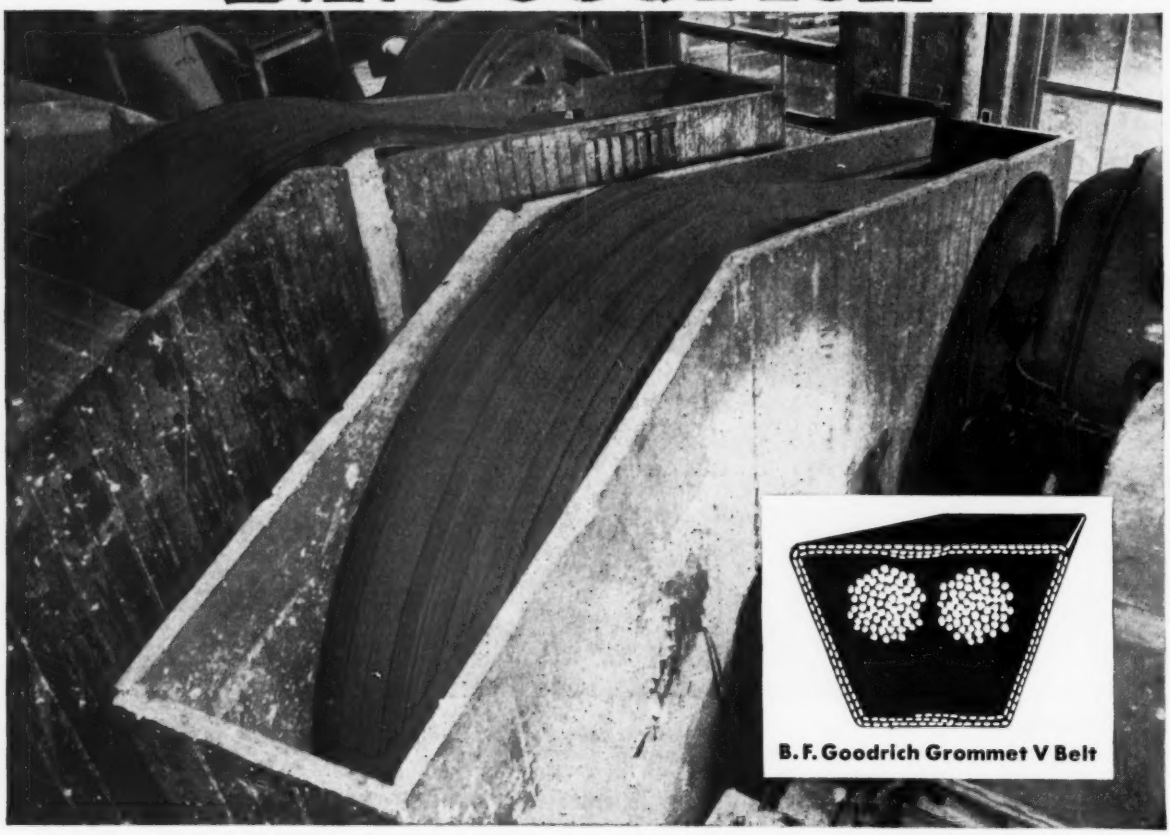
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



11 to 1 service record proves B. F. Goodrich belts last longer

User reports 3-way saving with grommet V belts

ORDINARY V belts on these drives lasted only a year. They couldn't take the 24-hour-a-day service, the heavy loads. Covers would separate from the belt, flap around the drive, get caught in pulleys, then tear off completely. Then a B. F. Goodrich distributor recommended grommet V belts. It proved to be a perfect solution. Installed in 1941, both sets of grommet V belts have already lasted 10 times longer, and still look good for years' more service. Here's why BFG grommet belts outlast and outperform ordinary belts:

No weak spots

The section where cords overlap is the weak spot in ordinary belts. That's where 85% of belt failures occur. But in B. F. Goodrich grommet V belts this cause of belt failures has been eliminated. All of the cord material in a grommet belt is *concentrated* in twin grommets. These grommets are cord loops, made like giant twisted cables except that they're endless. There are no splices or overlaps—no weak spots to cause premature belt failures.

Better grip, less slip

Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

Save 3 ways

This company, like many others, is making a 3-way saving with grommet V belts. First, they save on replacement costs because grommet belts last longer. They save on production costs with no shutdowns caused by belt failures. And they save on maintenance costs because these belts need less attention. Yet the savings they make are clear profit because grommet belts cost not one cent more than ordinary V belts. Next time you need V belts, order *grommet* V belts from your BFG distributor. *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio. (Available in Canada).*

Grommet V-Belts BY
B.F.Goodrich
FIRST IN RUBBER

ENGINEERING AND MINING JOURNAL

VOLUME 154 — 87th YEAR OF PUBLICATION — NUMBER 4

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Published monthly by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948), Founder. **Publication Office, 1309 Noble St., Philadelphia 23, Pa. Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 West 42nd St., New York 36, N. Y.** Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

Subscriptions: Address correspondence to Engineering and Mining Journal—Subscription Service, 1309 Noble St., Philadelphia 23, Pa., or 330 West 42nd St., New York 36, N. Y. Allow one month for change of address.

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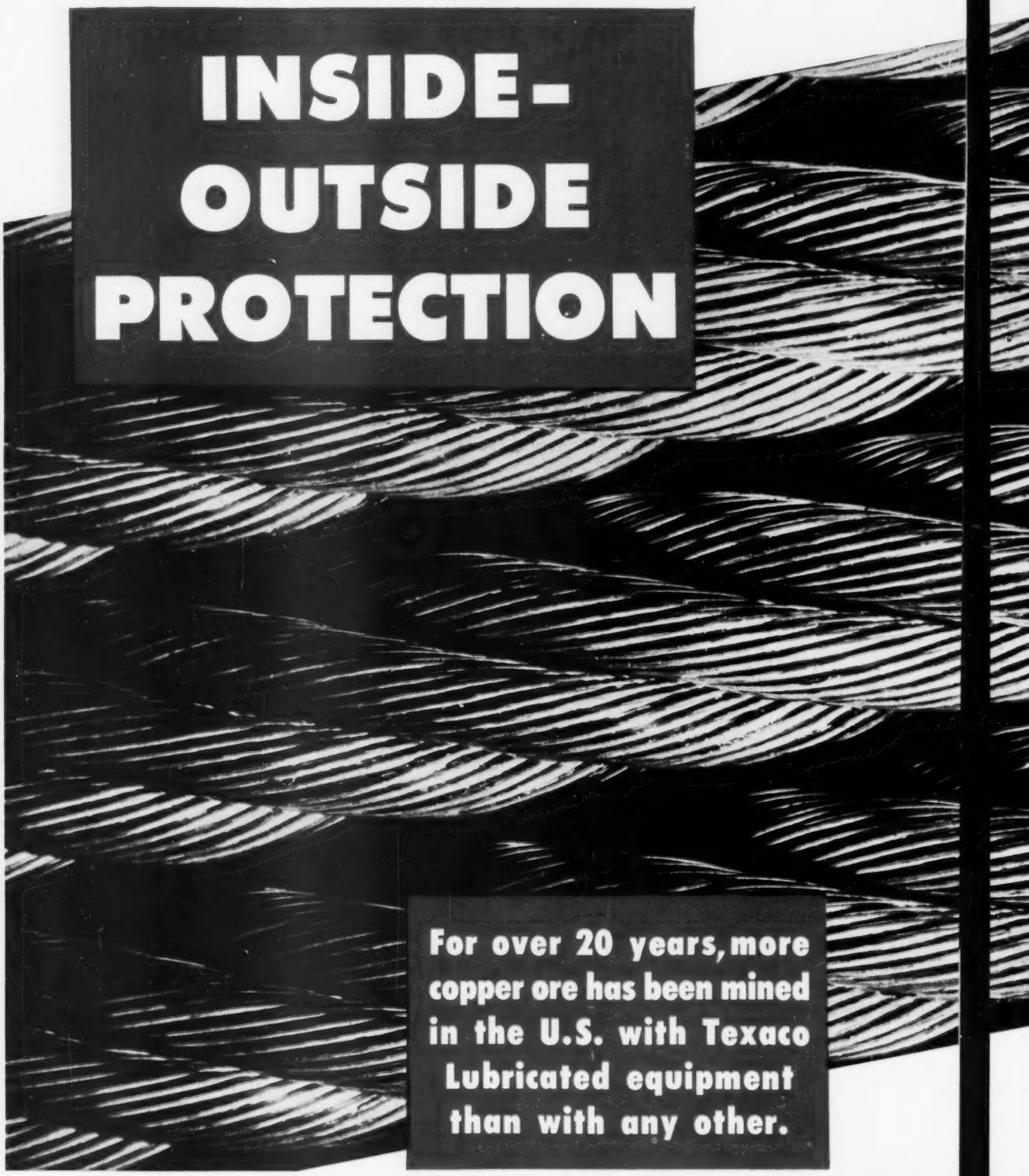
Price of this issue 50¢. Subscription rates: United States and possessions, $3 a year, $4 for 2 years, $5 for 3 years. Other Western Hemisphere, $5 a year, $8 for 2 years, $10 for 3 years. Elsewhere $15 a year, $25 for 2 years, $30 for 3 years. **Please indicate position and company connection in all subscription orders.**

Entered as second class matter May 24, 1951, at the Post Office at Philadelphia, Pa., under the Act of March 3, 1879. Copyright 1953 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Printed in U.S.A.

INSIDE-OUTSIDE PROTECTION



For over 20 years, more copper ore has been mined in the U.S. with Texaco Lubricated equipment than with any other.

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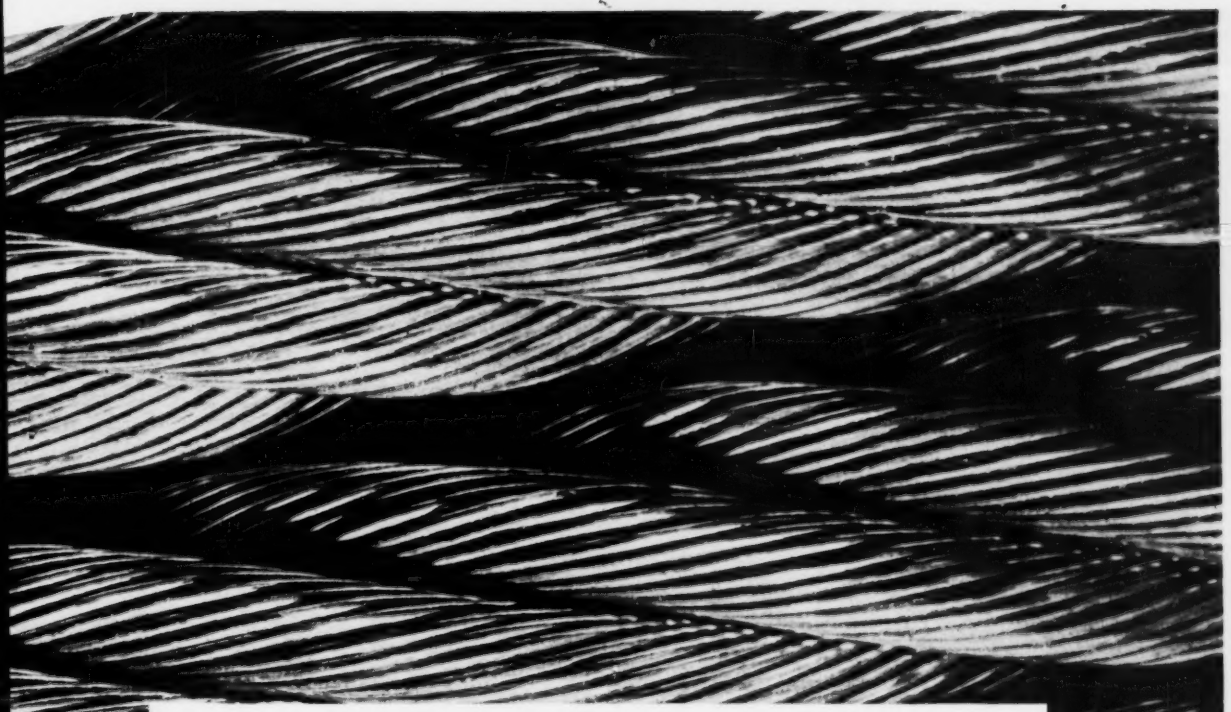
on television —
the TEXACO STAR THEATER
starring MILTON BERLE.

See newspaper for
time and station.

TEXACO

TEXACO



. . . to keep your wire rope STRONG LONGER

TEXACO CRATER is famous for its *quick* and *thorough* penetration. It goes right to the core of the rope, coating the outside metal strands with a tough, long-lasting lubricating film that defies wear and rust. This film also surrounds the hemp core, preserving its original oiliness and adding greatly to its life. Even under the most adverse conditions, *Texaco Crater* keeps wire rope strong longer, brings down maintenance costs.

Another widespread use for *Texaco Crater* is on open gears. Here, it clings to the gear teeth, cushioning shocks and heavy loads. *Texaco Crater* does not channel or throw off. Gears run more quietly, wear is negligible.

For added convenience in application, use *Texaco Crater X Fluid*. It *goes* on as a liquid *(without heating!)* and *stays* on just like the regular *Crater*.

In mine car wheels, use *Texaco Olympian Grease*. Ideal for plain, cavity hub or anti-friction bearings. It assures easier starts in winter and summer, reduces maintenance costs.

Let a Texaco Lubrication Engineer survey your equipment and recommend the effective lubrication that will improve performance and reduce costs. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

Lubricants and Fuels

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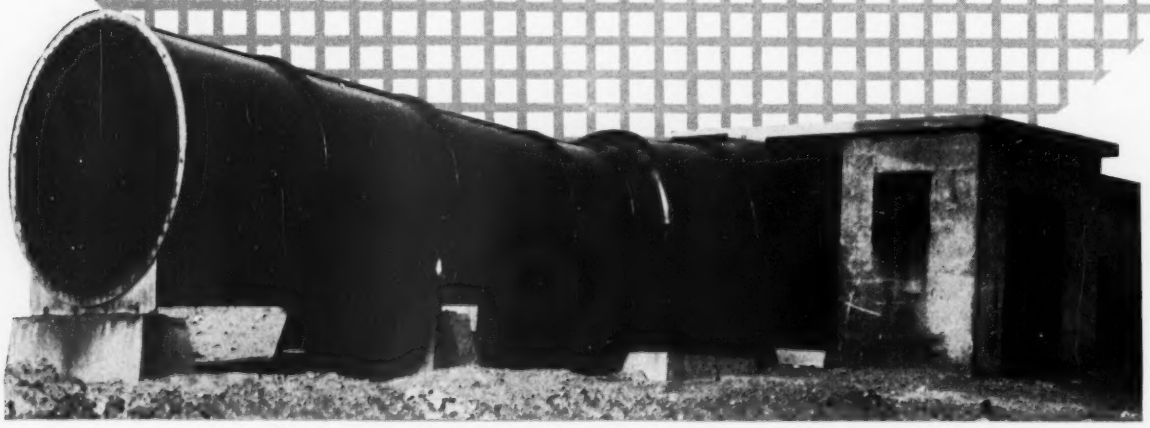


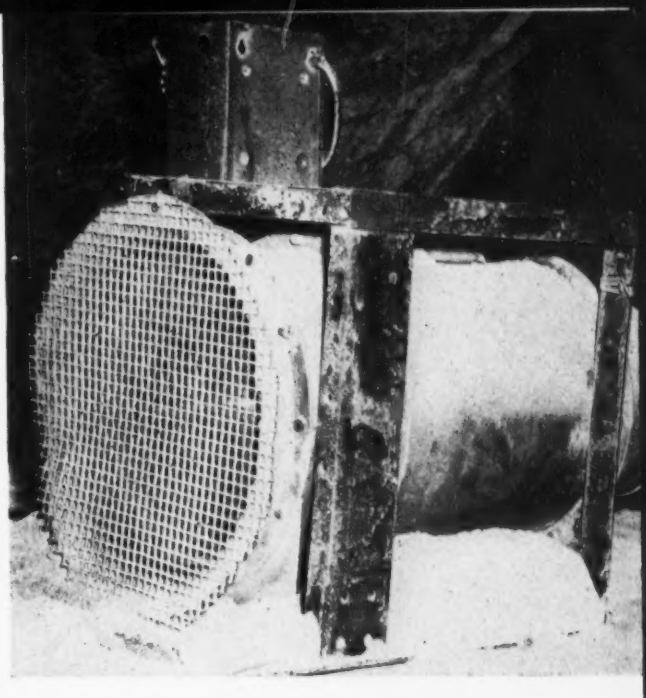
FOR MAIN VENTILATION—

JOY AXIVANE MINE FANS—the only fan with Simultaneously Adjustable Blades.

In the long run, you can count on more air at considerably lower overall cost with a JOY AXIVANE Mine Fan on the job. They're designed for lower speed operation and that means reduced maintenance and depreciation costs, because service life is increased and lubrication is simpler and more foolproof at lower speeds. What's more, you'll cut power costs with JOY's wide range of blade adjustment and simultaneously adjustable blades, giving you the highest possible efficiency over the widest possible operating range and eliminating guesswork settings. • No matter how your air demand changes, you can always keep a JOY Fan at top efficiency. *Let us survey your ventilation problem—no obligation.*

FOR SECONDARY VENTILATION—

JOY Series 1000 AXIVANE FANS with Standard Adjustable Blades.

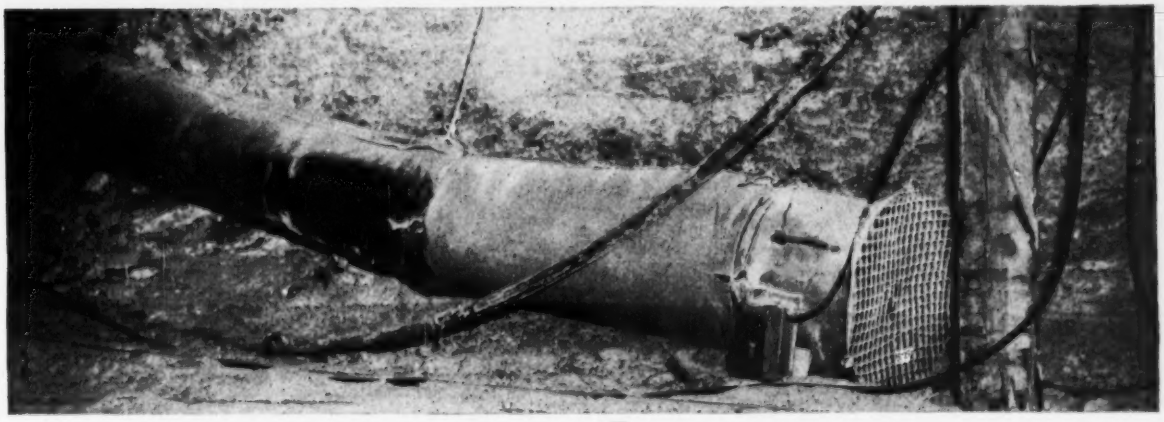


For smaller volumes, or where you may need additional capacity in a more or less permanent installation to supplement main ventilation, you'll find JOY Series 1000 AXIVANE Fans ideal. The vaneaxial design was pioneered by JOY in mine ventilation equipment. Series 1000 FANS are compact and space-saving, easy to handle and install, and relatively quiet in operation. They are the only fans in their class with adjustable blades as standard equipment, for your easy maintenance of peak efficiency over a wide range of air supply requirements.

FOR AUXILIARY VENTILATION—

JOY AXIVANE BLOWERS for either low or high pressure duties.

JOY AXIVANE Portable Blowers are all-purpose, two-in-one units. They not only provide smoother air flow and require minimum power, but operate with unmatched efficiency through any length of tubing. You don't need two types of blowers for different sections of the mine—JOY AXIVANE Blowers are suitable for either high or low pressure service. Available in types and sizes to meet every portable air supply requirement, and in electric or air-operated models.



Write for Bulletins, or *Consult a Joy Engineer*

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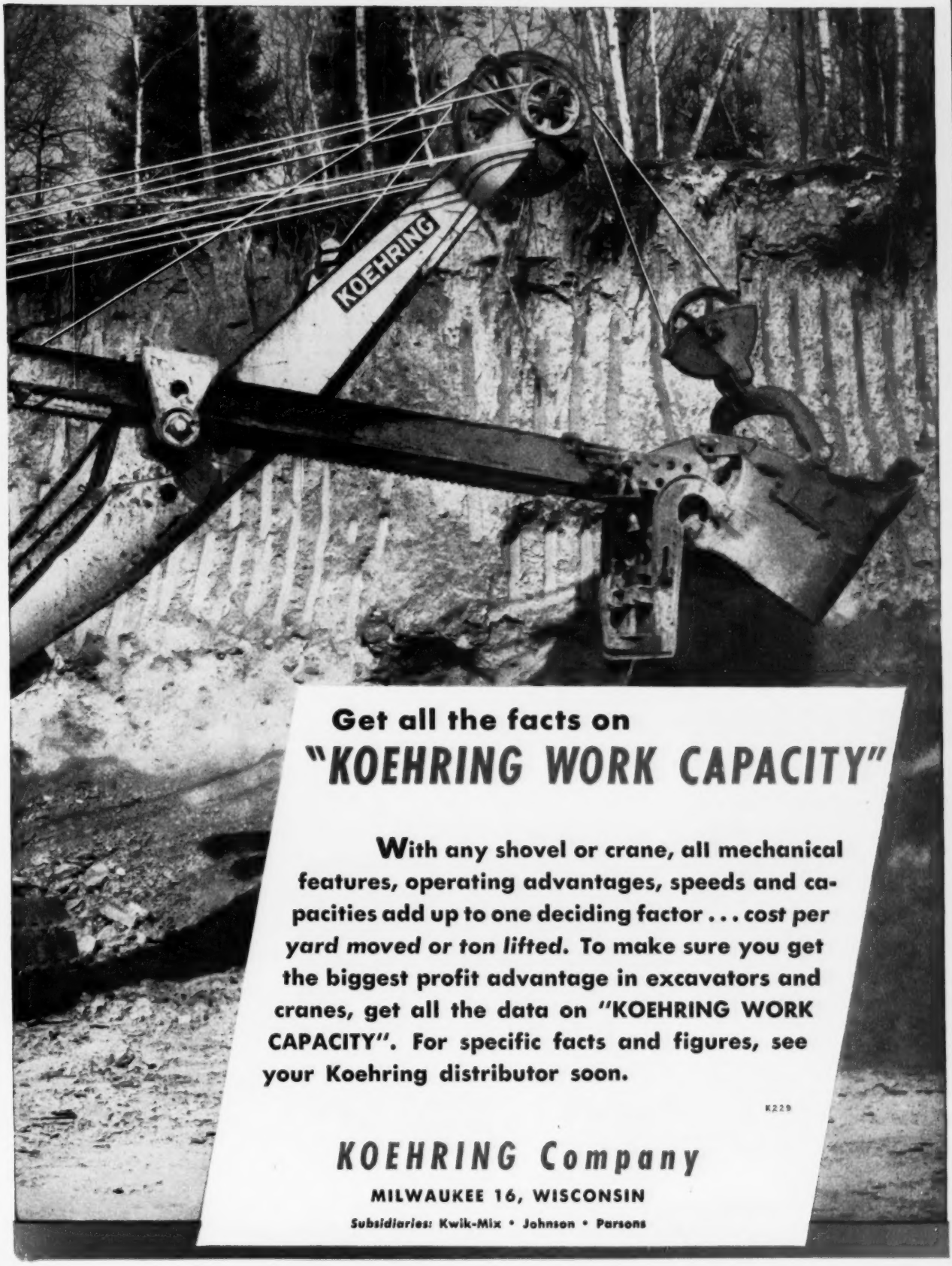

Get all the facts on
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With any shovel or crane, all mechanical features, operating advantages, speeds and capacities add up to one deciding factor . . . *cost per yard moved or ton lifted.* To make sure you get the biggest profit advantage in excavators and cranes, get all the data on "KOEHRING WORK CAPACITY". For specific facts and figures, see your Koehring distributor soon.

K229

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Eimco's are also good at digging unbroken ground for new roads, soil-silt deposits in riverbeds, taking up highway curb or shoulders, loading snow, clearing winter sluff, digging out frost blisters or digging ditches culverts or the toughest kind of rock loading.

Write for complete information on Eimcos stating your type of loading problem.

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"AT HOME" UNDERGROUND

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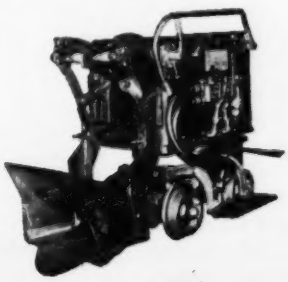
Eimco's, have a number of other advantages. They were designed to be "at home" underground. In tunnels where going is tough you'll find Eimco's more dependable. In mines where production by drawhole mining is practical you'll find Eimco's more economical. In the Uranium country, when its often desirable to sink an incline to the level of the ore body, you'll find Eimco's the only choice as they're as much at home on a slope as they are in level mining.

Write for more information on versatile Eimco loaders.

Eimco 12B Loader operating on slope and (below) operating on level ground in Uranium mine.

At right — Eimco 12B — Smallest mechanical loader — Economical, fast and versatile.



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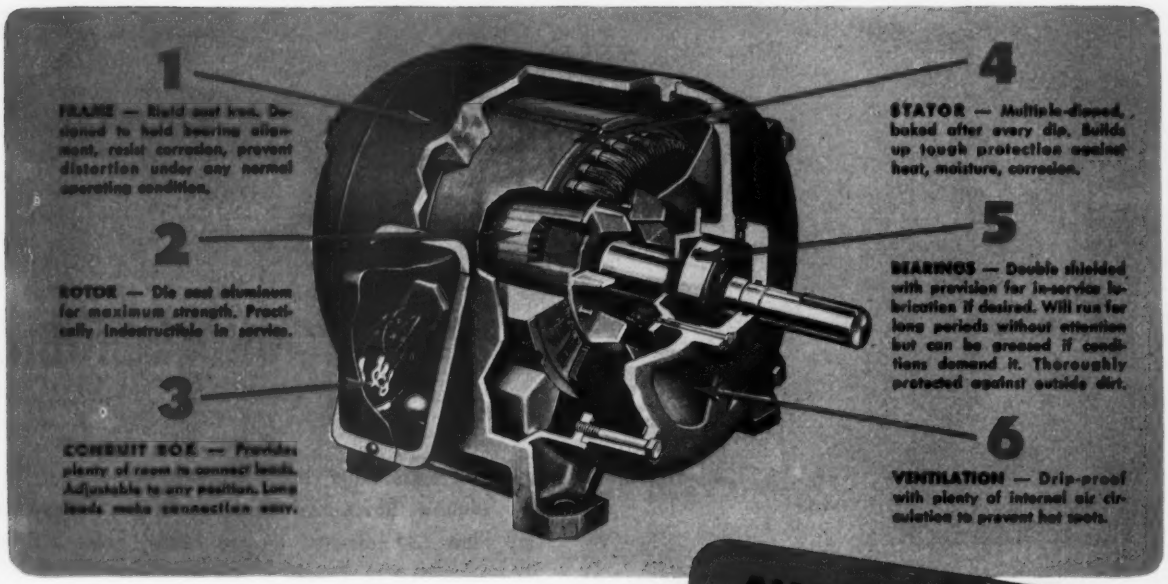
Look for These 6 Signs of Good Motor Design


1
FRAME — Rigid cast iron. Designed to hold bearing alignment, resist corrosion, prevent distortion under any normal operating condition.
2
ROTOR — Die cast aluminum for maximum strength. Practically indestructible in service.
3
CONDUIT BOX — Provides plenty of room to connect leads. Adjustable to any position. Long leads make connection easy.
4
STATOR — Multiple-dipped, baked after every dip. Builds up tough protection against heat, moisture, corrosion.
5
BEARINGS — Double shielded with provision for in-service lubrication if desired. Will run for long periods without attention but can be greased if conditions demand it. Thoroughly protected against outside dirt.
6
VENTILATION — Drip-proof with plenty of internal air circulation to prevent hot spots.

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Certified Service — Nearly 100 Allis-Chalmers Certified Service Shops provide factory-approved parts and service on your Allis-Chalmers motors. Screened for modern equipment, adequate experience and business integrity, these independently owned service shops will provide you with prompt, economical repair and maintenance.

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Application Engineering — Your Allis-Chalmers District Office representative or Authorized Dealer will be glad to help you select exactly the right motors for your needs. For additional information, write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 51B6052. A-3954

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TEXROPE V-belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.

PUMPS — Integral types from ¾ in. to 72 in. discharge and up.

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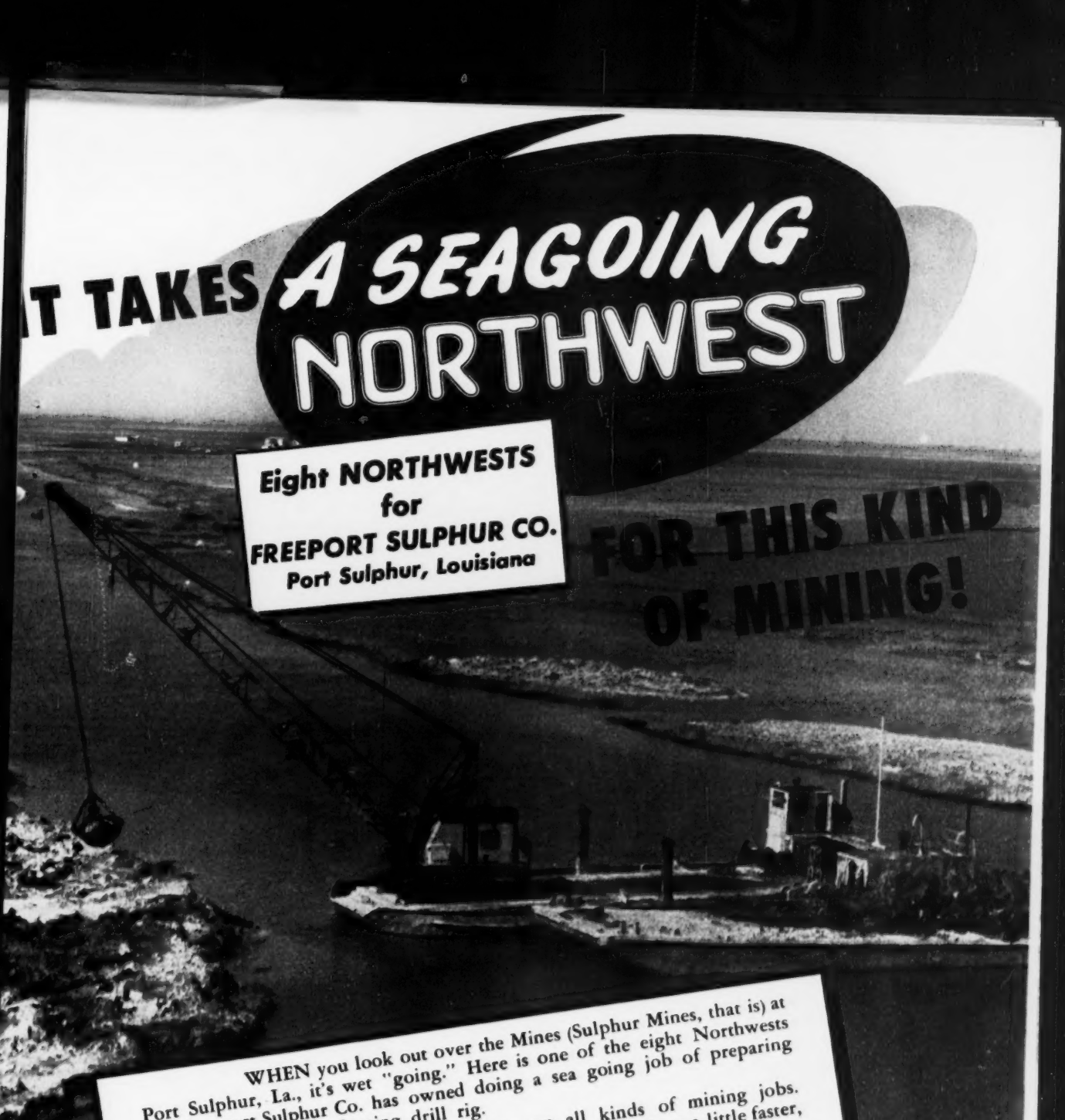

IT TAKES A SEAGOING NORTHWEST

Eight NORTHWESTS for FREEPORT SULPHUR CO. Port Sulphur, Louisiana

FOR THIS KIND OF MINING!

WHEN you look out over the Mines (Sulphur Mines, that is) at Port Sulphur, La., it's wet "going." Here is one of the eight Northwests that Freeport Sulphur Co. has owned doing a sea going job of preparing drilling sites for the floating drill rig.

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The Northwest Dual Independent Crowd utilizes force most other Independent Crowd Shovels waste.

Uniform Pressure Swing Clutches, the "Feather-Touch" Clutch Control, the Cushion Clutch and other Northwest advantages make it a superior machine in mining work.

Now is the time to learn about Northwest equipment. Plan to have one. Talk it over with a Northwest man.

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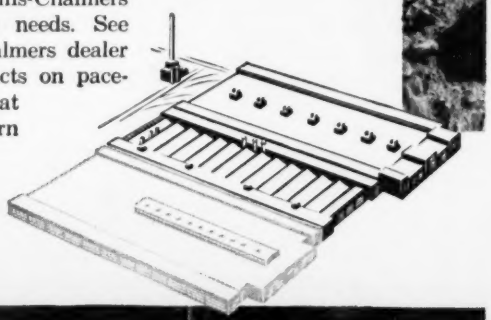
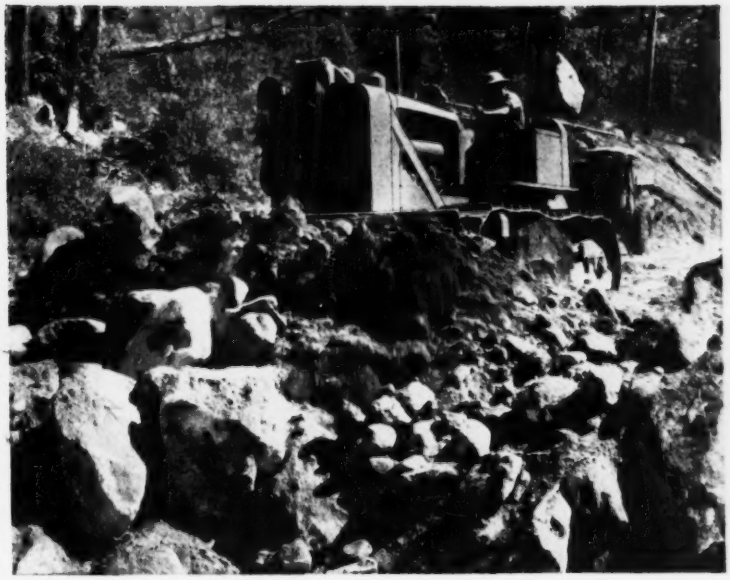
The real "pay-off" value of any tractor to its owner is how it measures up to the standards set by today's modern production methods.

To meet these needs, Allis-Chalmers started from scratch and built *a line of tractors with a future.* Thousands now have been tested and proved on the toughest proving ground of them all, actual jobs, and they have more than measured up to expectations. Owners have found that these tractors set new standards of performance . . . that they give greater output with less down time . . . plus more profit, whether pulling, pushing, digging or dozing. Operators have discovered new ease and comfort in operation, too; and mechanics say these are the easiest-to-service tractors that they have ever worked on.

Yes, the "family circle" of users of Allis-Chalmers tractors is growing constantly. Many users who bought their first Allis-Chalmers tractor only a few years ago now have fleets of them, and many others who operate only one or two tractors have become Allis-Chalmers boosters.

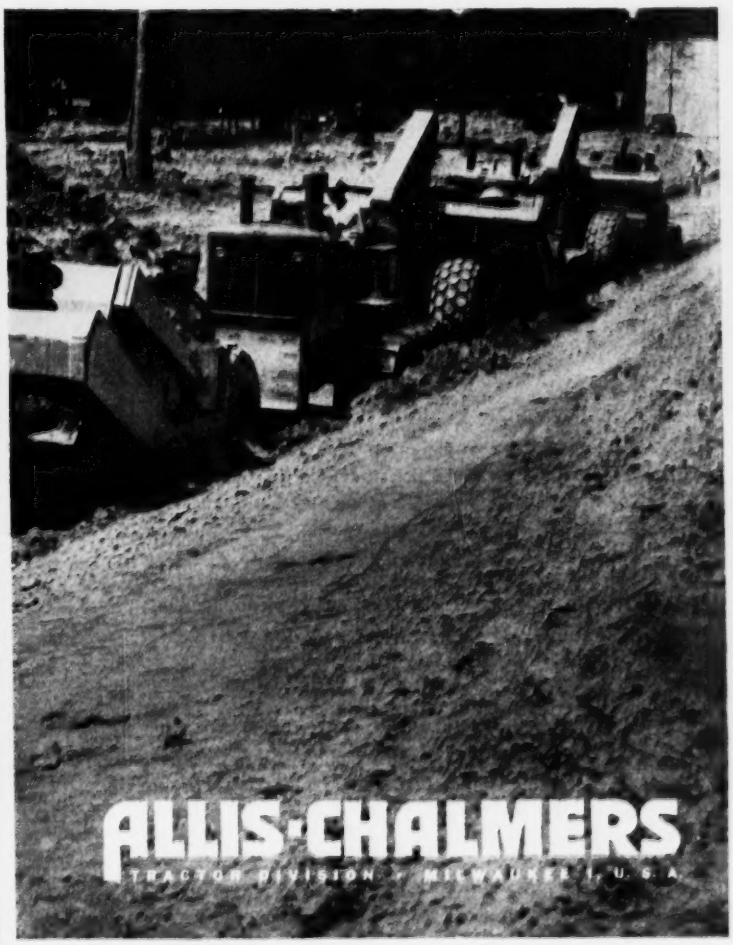
This acceptance is the springboard behind a big plant expansion at Springfield, Illinois, which will enable Allis-Chalmers to meet *your* future needs. See your nearby Allis-Chalmers dealer now for the inside facts on pace-setting tractors that measure up to modern production methods.





For stripping overburden, hillside seams, cleaning pit bottoms, building access roads . . . wherever big production is essential to the job, this big HD-15 has more than proved its worth. With 109 drawbar hp. and 27,850-lb. weight, it works quickly, efficiently as a dozer, tractor-shovel, puller or pusher.

This 72 drawbar hp., 18,800-lb. HD-9 is making friends in every field because its power and weight make it an ideal size for dozens of today's modern jobs. In addition, operators can gain up to 25 percent more production on short dozing jobs because they can go from any forward speed to any reverse speed with just one shift.

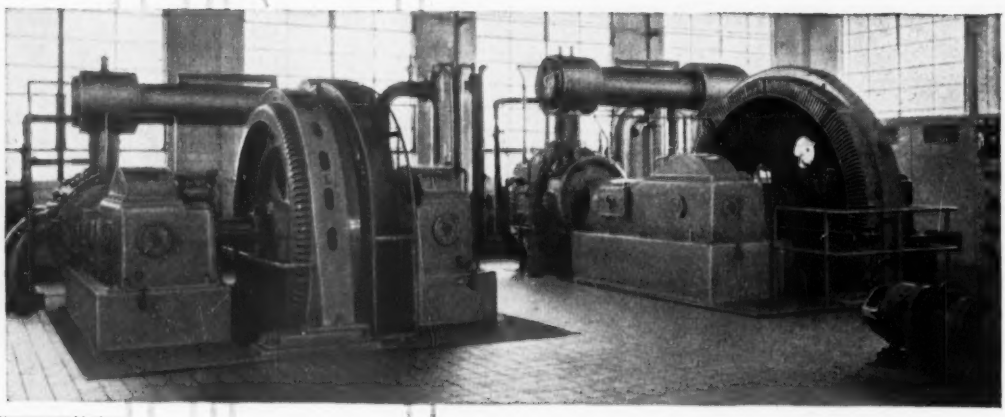


The 40-drawbar hp., 11,250-lb. HD-5 is a versatile jack of all jobs above or below ground. With hydraulically controlled Tracto-Shovel, it's equally useful handling ore and coal, cleaning up around conveyors and hoppers, loading hauling units, dozens of other jobs.

Here's real tractor teamwork . . . four HD-20's in a "train" — three pulling scrapers, one pushing — all working together for big production. With torque converter drive, they synchronize speeds at contact . . . automatically load at the fastest speed that job conditions permit, with less strain on operators and equipment. With 175 engine hp. and 41,000 lb. weight, the HD-20 is today's new yardstick of crawler tractor performance.

NO CLOCK PUNCHING

for these compressors

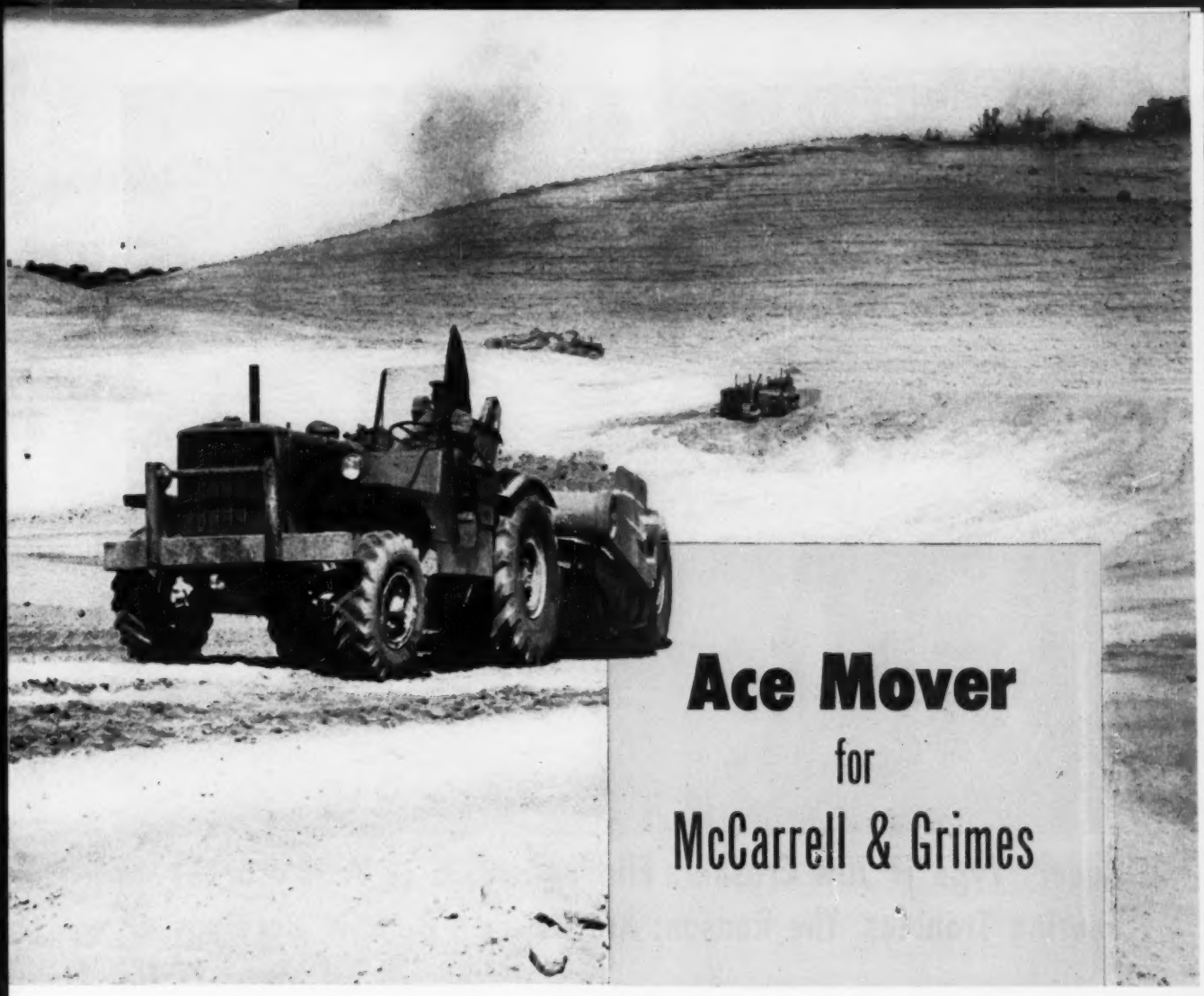


That's right! There's no daily time limit placed on the work output of Chicago Pneumatic Class O-CE Compressors . . . they operate "around the clock" with a minimum of attention. Designed for continuous, year-in, year-out heavy industrial usage, these units are unsurpassed for a dependable air power supply at low cost. Built in sizes up to 2,000 hp, for pressures up to 5,000 lbs., they are available in horizontal, two-stage, water-cooled types with direct-mounted synchronous motor drive.

The Chicago Pneumatic Class O-CE Compressor is equipped with roller bearings, Simplate valves for low power consumption, streamlined air passages to cut down air flow resistance, CP Multi-Step Control for partial load economy, and a CP Intercooler for maximum heat transfer and low water consumption. Ask for Bulletin 726. *Chicago Pneumatic Tool Company, 8 East 44th Street, N. Y. 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



Ace Mover for McCarrell & Grimes

In the past 10 years, McCarrell & Grimes have moved more than 3,500,000 cu. yd. of overburden – 95% with Caterpillar equipment. Partner C. A. McCarrell says: "The thing we like best about it is its long life, dependability and economy of operation."

The partners mine a bentonite deposit near Sanders, Arizona. The overburden, a mixture of clay and sand, ranges from 60 to 100 feet deep. Ace strippers and movers on long hauls are fast-stepping Cat* DW10 Tractors with No. 10 Scrapers. Here are some production figures. A DW10 unit averages 11 loose yards per load, 10 trips per hour, on a 3,600-ft. round-trip haul. That's 880 yards per unit per 8-hour day. And the DW10s are doing it day after day with a minimum of down time.

What makes the DW10 a profitable producer? Watch one work – in any kind of material – and you'll see why. Cable controlled, it loads fast – spreads fast. It's got speed on the road, with power and traction aplenty to whip adverse grades. Three-point suspension enables it to keep four wheels *on the ground* in bumpy going. Big tires float it over soft stuff. And it turns quickly and easily. Another plus: *safety*. Anti-jackknife devices give the operator the confidence to keep it moving at top speed. All this, and other advantages, spell *fast cycle time*.

Your Caterpillar Dealer backs every unit with genuine parts and prompt service, *when* and *where* you need it. Ask him for a demonstration – he'll be glad to show you what the DW10 can do on your toughest job!

Caterpillar Tractor Co., Peoria, Ill.

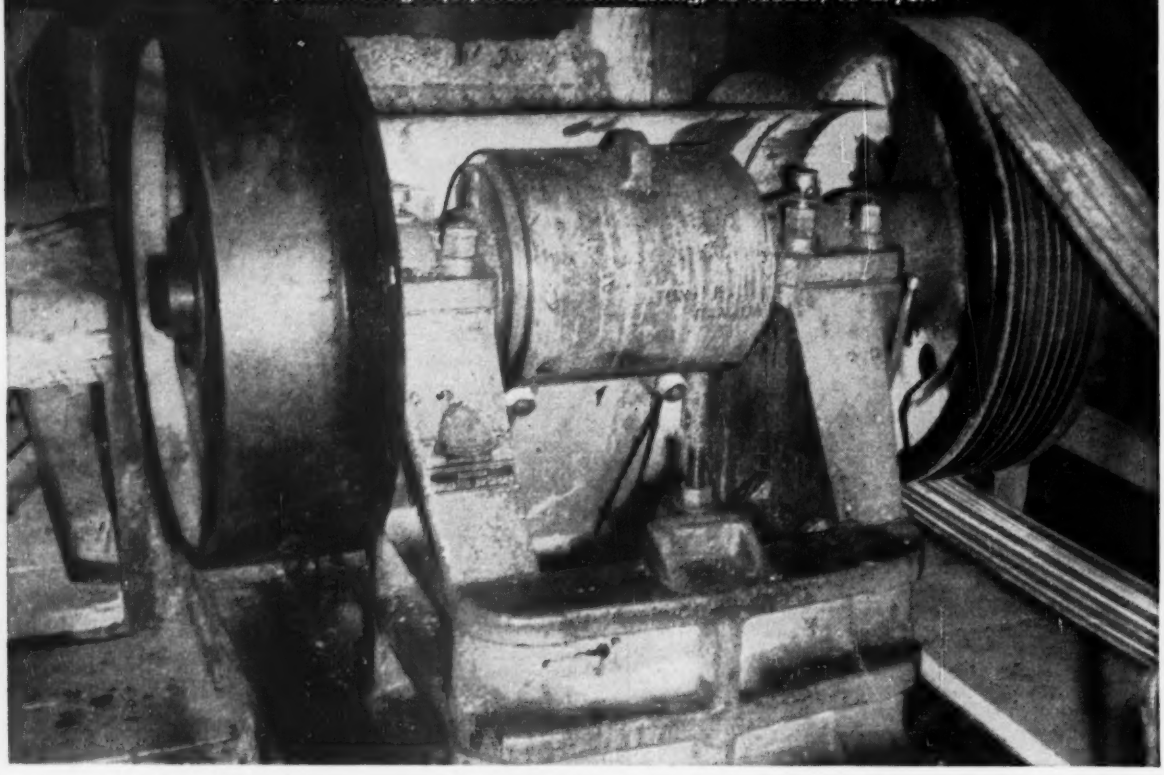
CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks – ®

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

DENVER JAW CRUSHERS

Complete Milling Equipment—from testing, to feeder, to dryer!



Denver Type 'H' Jaw Crushers Eliminate 95% of Your Crusher Bearing Troubles. The Reason: Anti-Friction Bumper Bearings

Bronze bumper bearings in low-cost crushers have always been a source of trouble. Deco has eliminated these difficulties and still remained in the moderate price field with the Denver Type "H" Forced Feed Jaw Crusher.

ANTI-FRICTION BUMPER BEARING

A heavy-duty roller bearing has been designed into the bumper, the most serious zone of bearing trouble. (Deco research engineers found 95% of all crusher break-downs were caused by failure of old-fashioned bumper bearings.) Also, a large diameter alloy steel shaft reduces shaft deflection on the bearings, this gives longer bearing life.

CAST STEEL FRAME

Frames on the 8″ x 10″ and larger sizes of the Denver Type "H" Crusher are electric cast steel. The frame is also heavily reinforced to withstand severe service.

OTHER CONSTRUCTION FEATURES

Jaw plates are reversible 13%-14% manganese steel. The bumper is heavy, electric cast steel. Grease fittings are conveniently located, and bearings are sealed against dirt.

SIZES

Denver Type "H" Forced Feed Jaw Crushers are available in sizes 2¼″ x 3½″, 3¼″ x 4½″, 5″ x 6″, 8″ x 10″, 10″ x 16″, 10″ x 20″, and 11″ x 30″. Shipment of most sizes is normally made direct from stock, so you can get immediate delivery!

BIG CRUSHERS, ALL ANTI-FRICTION BEARINGS

Denver Type "J" Jaw Crushers—with both anti-friction bumper and side bearings, and one-piece steel frame are available from 9″ x 12″ through 32″ x 40″.

Write or wire today—find out how you can get maximum jaw crusher service by using a Denver Jaw Crusher!

Free Technical Bulletin Sent On Request

Over 25 years of Flotation Engineering

DENVER EQUIPMENT COMPANY

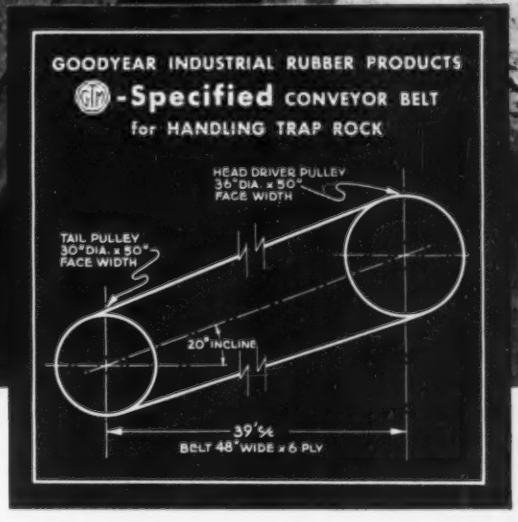
1400 SEVENTEENTH ST. DENVER 17, COLORADO

3 Times the service

ON TRAP ROCK CONVEYOR

ORIGINAL belt lasted 3 years before wearing through in handling rough, abrasive trap rock up to 12" lumps in size.

G.T.M.—Goodyear Technical Man—recommended Stacker Conveyor Belt which has served more than three times as long. Belt is still in service after handling 1,458,233 tons.



LOOK FOR YOUR GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR *in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods." He handles Hose, Flat Belts, V-Belts, Molded Goods, Packing, Tank Lining, Rubber-Covered Rolls built to the world's highest standard of quality.*

GOODYEAR

THE GREATEST NAME IN RUBBER

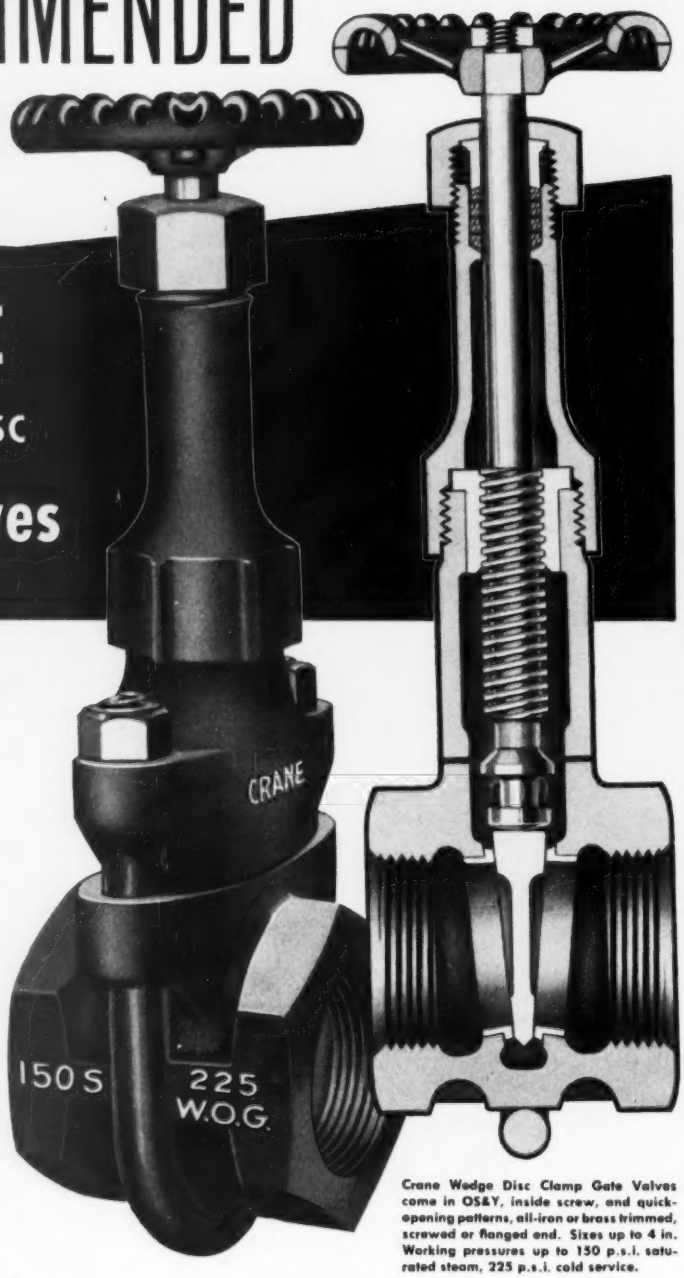
HIGHLY RECOMMENDED

for low cost service

CRANE

IRON BODY—WEDGE DISC

Clamp Gate Valves



Crane Wedge Disc Clamp Gate Valves come in OS&Y, inside screw, and quick-opening patterns, all-iron or brass trimmed, screwed or flanged end. Sizes up to 4 in. Working pressures up to 150 p.s.i. saturated steam, 225 p.s.i. cold service.

Low in first cost, as well as in upkeep . . . and look at their wide utility—

Use Crane Clamp Gate Valves for steam; hot and cold water; crude, fuel, and lubricating oil; air, gas, and gasoline service.

Also in food and chemical process industries for caustic solutions, alkalies, corrosive chemicals, and gases.

You'll find Crane Clamp Gate Valves extra rugged, with a strong reinforced body and husky stem. Their compact design means a better fit for more places . . . a saving on piping in many cases. And because of the simplified clamp construction, these valves enjoy wide favor where frequent cleanout is essential. The bonnet assembly and wedge disc lift out easily—the body stays in the line. Reassembling is no problem—the bonnet joint makes up tight and stays tight.

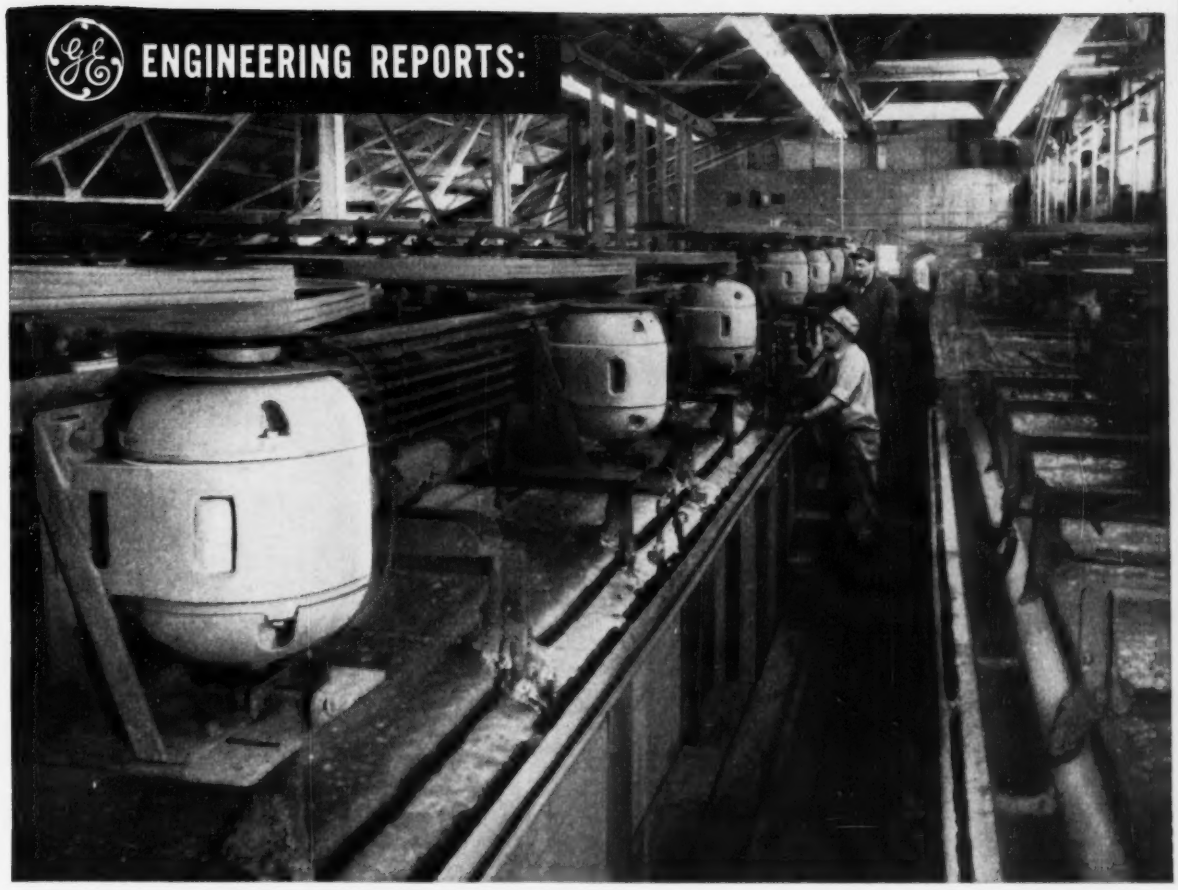
Wide choice of regular patterns, all-iron or brass trimmed. On inside screw all-iron valves, an improved self-draining bonnet prevents entrapment of line fluids in the bonnet—protects the threads, keeps the stem working smoothly. Send for Folder AD 1667 or ask your Crane Representative for full details.

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES · FITTINGS · PIPE · PLUMBING · HEATING



NEW TECHNIQUE OF COBALT FLOTATION was worked out in a pilot plant at Calera's Cobalt, Idaho installation to mill ore assaying 0.70 per cent cobalt. Reliability of the mill operation is promoted by the G-E engineered electrical system.

Calera will concentrate 1000 tons per day to ease cobalt shortage

Output kept continuous at new mine and mill by G-E engineered electrical layout

Soaring military demands for scarce cobalt—vital metal used in jet engines, armor plate, shells, and other weapons—will be met in 1953 with the help of the Calera Mining Company's new mine and mill at Cobalt, Idaho.

To keep the concentrator operating continuously, with fewest possible outages, this Howe Sound subsidiary turned to General Electric during the planning stage for help in engineering the electrical system. G-E application engineers designed—as a co-ordinated unit—the electrical layout for the mine, the mill, and the new town of Cobalt.

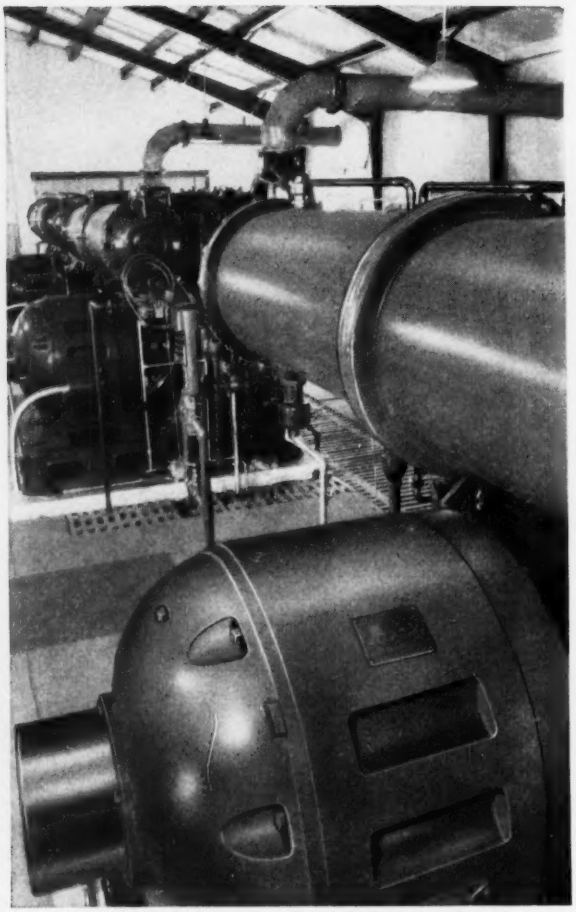
Thanks to the carefully planned flexibility of this electrical system, the Calera Company met government requests to increase the concentrator's capacity by 40 per cent without serious delay.

GENERAL ELECTRIC

TURN PAGE FOR PHOTO REPORT

1. ORE TRANSFERRED ON MINE LEVEL is handled by this 4-ton General Electric battery trammer.

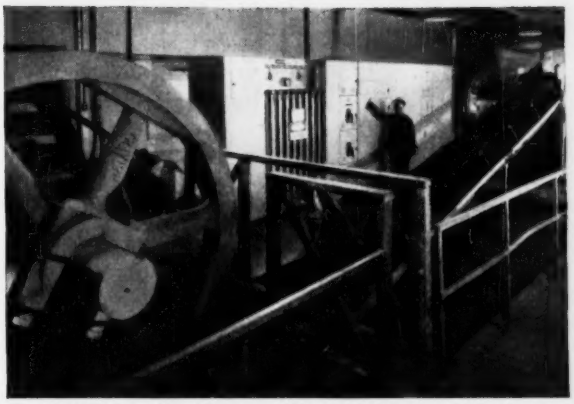
2. DEPENDABLE VENTILATION—to clear the air after blasting in the mine—is provided by this 30-hp totally-enclosed G-E motor. It runs continuously when the mine is worked.



3. AIR COMPRESSORS are driven by 300-hp G-E motors. Compressor building also houses a standby diesel generator which supplies emergency power for surface plant facilities.

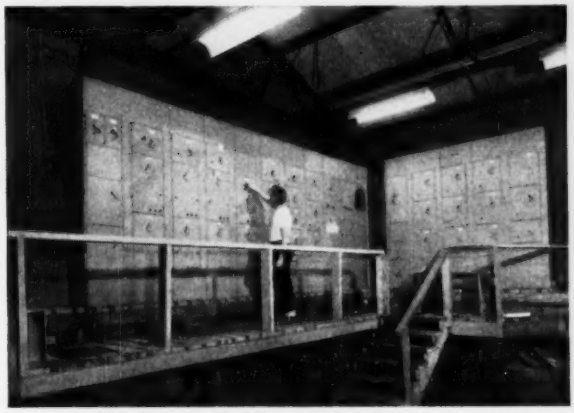
Major cobalt mine in U.S. relies

THIS 1000-TON CONCENTRATOR at Cobalt, Idaho, separates a copper, a cobalt, and an iron product. Crushing plant and concentrator are located close to mine portal. Treatment involves long conditioning of the pulp with lime at 80 to 90 degrees Fahrenheit.

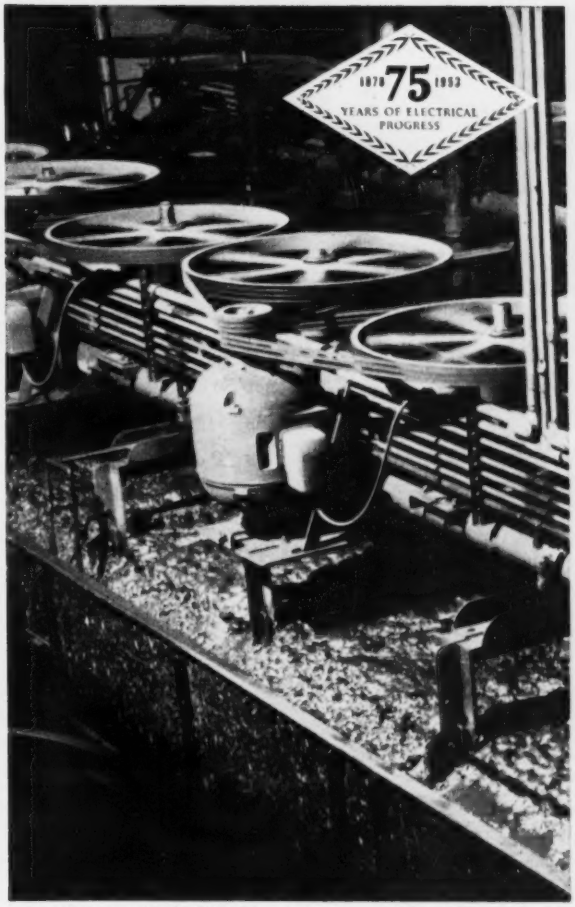


4. PRIMARY AND SECONDARY CRUSHERS—driven by G-E Tri-Clad* motors—are supplied from a 480-volt wye-connected, solidly grounded G-E load-center unit substation.

*Registered trade-mark of General Electric Co.



5. CONTINUITY OF PRODUCTION is better assured by this General Electric motor control center. It contains small motor starters, feeders for crane, lighting and power circuits.



6. ORE IS PROCESSED in flotation cells, driven by G-E motors, then concentrates are shipped to the Howe Sound Company's new $2,500,000 cobalt refinery at Garfield, Utah.

on co-ordinated electrical system

More than two years of pilot-plant testing—and the development of a novel technique of selective cobalt flotation—was needed before the new Calera mill started operating as the first major source of domestic cobalt.

To assure reliable power distribution and motor operation for the new installation, Howe Sound specified G-E equipment throughout. G-E application engineers, working closely with Howe Sound's engineers, designed a completely co-ordinated electrical system. Further, G-E service engineers were on hand for equipment start-up and during the "breaking-in" period. As an indication of their satisfaction with the electrical system, Howe Sound specified G-E equipment for their new $2,500,000 cobalt refinery at Garfield, Utah, just now going into operation.

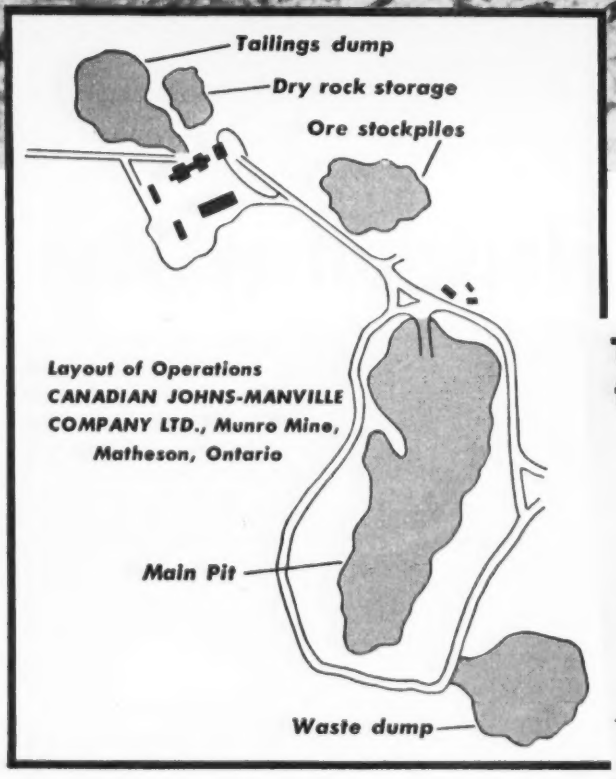
Whatever your electrical needs—large or small, modernization or expansion—G-E application engineers can help you and your consultants. Contact your local G-E Apparatus Sales Office. General Electric Co., Schenectady 5, N. Y. 660-28

Engineered Electrical Systems for the Mining Industry

GENERAL ELECTRIC

JOHNS-MANVILLE uses T

Tournatractor cleans snow from pit floor. Note good condition of tires after 3000 hours work on abrasive, rocky materials.



Layout of Operations
CANADIAN JOHNS-MANVILLE COMPANY LTD., Munro Mine, Matheson, Ontario

Tournatractor "time-table" for typical month's work

• Dozing ore to crusher, cleaning around 4 shovels, maintaining ore stockpile	238 hrs.
• Maintaining tailings dump	87 hrs.
• Maintaining waste dump	62 hrs.
• Towing equipment	43 hrs.
• Plowing snow	62 hrs.
• Odd jobs	43 hrs.
Total working time for month	**535 hrs.**

High-speed, rubber-tired excavating • hauling

Tournatractor *on mine maintenance*

On tailings dump, "C" moves up to 3 cu. yds. per load. With big 21.00 x 25 low-pressure tires and 4-wheel drive, rig has plenty of flotation and traction in the soft, loose footing.

Canadian Johns-Manville Ltd., the world's largest asbestos producer, works a 19 mph, rubber-tired C Tournatractor on mine maintenance at their Munro open-pit near Matheson, Ontario.

Their 186 hp "C" works 24 hours per day, 6 days per week, handling scattered jobs. During a typical 24-hour period, rig maintains stockpile and dozes ore to crusher . . . cleans up for three 2½-yard shovels and one ¾-yard shovel . . . maintains tailings and waste dumps . . . clears gabro rock and wet blue clay overburden . . . tows compressors, wagon drills and other mine equipment. Unit moves from job to job without delay.

With Angledozer blade at full 20° angle, Tournatractor clears path 12' wide in one pass. Grade is 7% . . . temperature, 37° below zero. Rig often worked in temperatures of 50° below.

Plows 26 mi. of road in 6¾ hrs.

In addition to this regular mine maintenance, Tournatractor also plows snow. After one heavy snow, rig traveled 30 miles and cleared 26 miles of road in 6¾ hours! First, it opened the highway from the mine to the nearby town of Holtyre (8 miles). Then, it returned 4 miles over the same road to an intersection . . . plowed the road to Matheson (7 miles) . . . cleared city streets and company warehouse grounds there . . . and returned 11 miles to the mine, widening road it previously opened.

95% efficient over 3000 hours

At other times during the winter, the "C" plowed and maintained haul roads, helped pull shovel up steep grades on moves from pit to pit, and did odd jobs around the shop. In 3,000 working hours, Tournatractor recorded a 95% mechanical efficiency.

Why not find out for yourself how Tournatractor's 19 mph speeds on rubber can get more work done, at lower cost per job? Call your LeTourneau Distributor for a demonstration on your job at no obligation.

Tournatractor's ability to make self-powered moves anywhere at speeds up to 19 mph provides quick service to all parts of the Munro Mine . . . which processes 2,000 tons of rock through mill daily.

Angledozer—Tradenark Reg. U. S. Pat. Off. Tournatractor—Tradenark D-204-M

• **lifting · equipment**

R. G. LeTOURNEAU, INC.
Peoria, Illinois

SWEATING OVER A

Hot Material*

HANDLING PROBLEM?

Here Are 7 Good Reasons Why Rex Pan Conveyors Can Solve It For You When Cooling En Route Is Desired

1. Conveyor designed so that ratio of mass of dead load (pans, etc.) and live load is correct for efficient heat transfer. Maximum initial temperatures are thus easily handled. Localization of intense heat can be controlled.
2. Shape of pans provides maximum surface area for efficient cooling and is suitable for carrying up inclines up to 25°.
3. Chain and carrying rollers removed from intense heat zone.
4. Wear largely confined to heavy, carrying outboard rollers on sleeve-type bushings made of hard, long-wearing, heat-treated white iron.
5. Unique outboard roller construction permits easy servicing without disassembling chain or conveyor. Simple graphite lubrication.
6. Low power requirements because of large diameter carrying rollers.
7. Through rods at joints for increased rigidity and much longer chain life.

* Calcined, Sintered, Briquetted, Nodulized, etc., over 300° F.

Investigate the ways that Rex Apron and Pan Conveyors can help solve your hot material handling problems today. Call your nearest Rex Field Sales Engineer or write for complete details. Chain Belt Company, 4679 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT REX COMPANY

Chain Belt COMPANY OF MILWAUKEE

Atlanta • Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • El Paso • Houston • Indianapolis • Jacksonville Kansas City • Los Angeles • Louisville • Midland, Texas • Milwaukee • Minneapolis New York • Philadelphia • Pittsburgh • Portland, Oregon • Springfield, Mass. • St. Louis • Salt Lake City • San Francisco • Seattle • Tulsa • Worcester

Distributors located in principal cities in the United States and throughout the world
EXPORT OFFICES: Milwaukee and 19 Rector Street, New York City

MANCHA'S LITTLE TRAMMER

A small locomotive with a big reputation for profitable haulage

Operating wt., 11½ tons

The rugged reliability of Mancha's Little Trammer keeps a supply of empties at the chutes and working faces, and a steady string of loads at the shaft or mill bin.

Before you buy, get the "low-down" on this powerful little storage battery locomotive. It is small enough for narrow, crooked drifts; its hinged cab permits short caging length for easy transfer from level to level. Climate, altitude and poor ventilation cannot slow it down; it does more work at lower cost than man power or animal power; its maintenance cost is surprisingly low.

Will a Mancha Storage Battery Locomotive pay in your mine?

Whether or not you are in the market for new haulage equipment . . .

YOU CAN HAVE THE ANSWER *NOW!*

Simply write for our "haulage data form." Fill it in and mail it back to us. This information will enable us to tell you if Mancha's Little Trammer can be profitable to you.

Mail the coupon today, and get valuable information for reference now, and in the future.

WE MAKE A COMPLETE LINE OF STORAGE BATTERY LOCOMOTIVES, FOR ALL CLASSES OF MINE SERVICE

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E & MJ - 453

Send your "haulage data form."

NAME _____

FIRM _____

ADDRESS _____

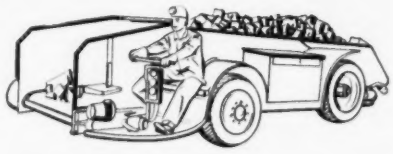
CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE
Division **GOODMAN** *Manufacturing Company*
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

The NEW T-H Exide-Ironclad

★ 20% more capacity in the same space

★ Lowest cost per A.H. to own and operate



Heavier demands on all types of battery-powered haulage equipment dictate the need for batteries with greater capacity.

The new Exide-Ironclad T-H battery gives 20% more capacity in the same space—WITHOUT SACRIFICE OF LONG LIFE for which Exide-Ironclad Batteries are famous.

This new T-H battery is of the time-tested Exide-Ironclad construction, employing the exclusive slotted tube positive plate. New materials have made structural changes possible, which permit the use of larger positive plates—resulting in increased capacity.

The T-H line of Exide-Ironclad Batteries includes capacities for all battery-powered haulage units.

Now-more than ever before... YOUR BEST POWER BUY AT ANY PRICE!

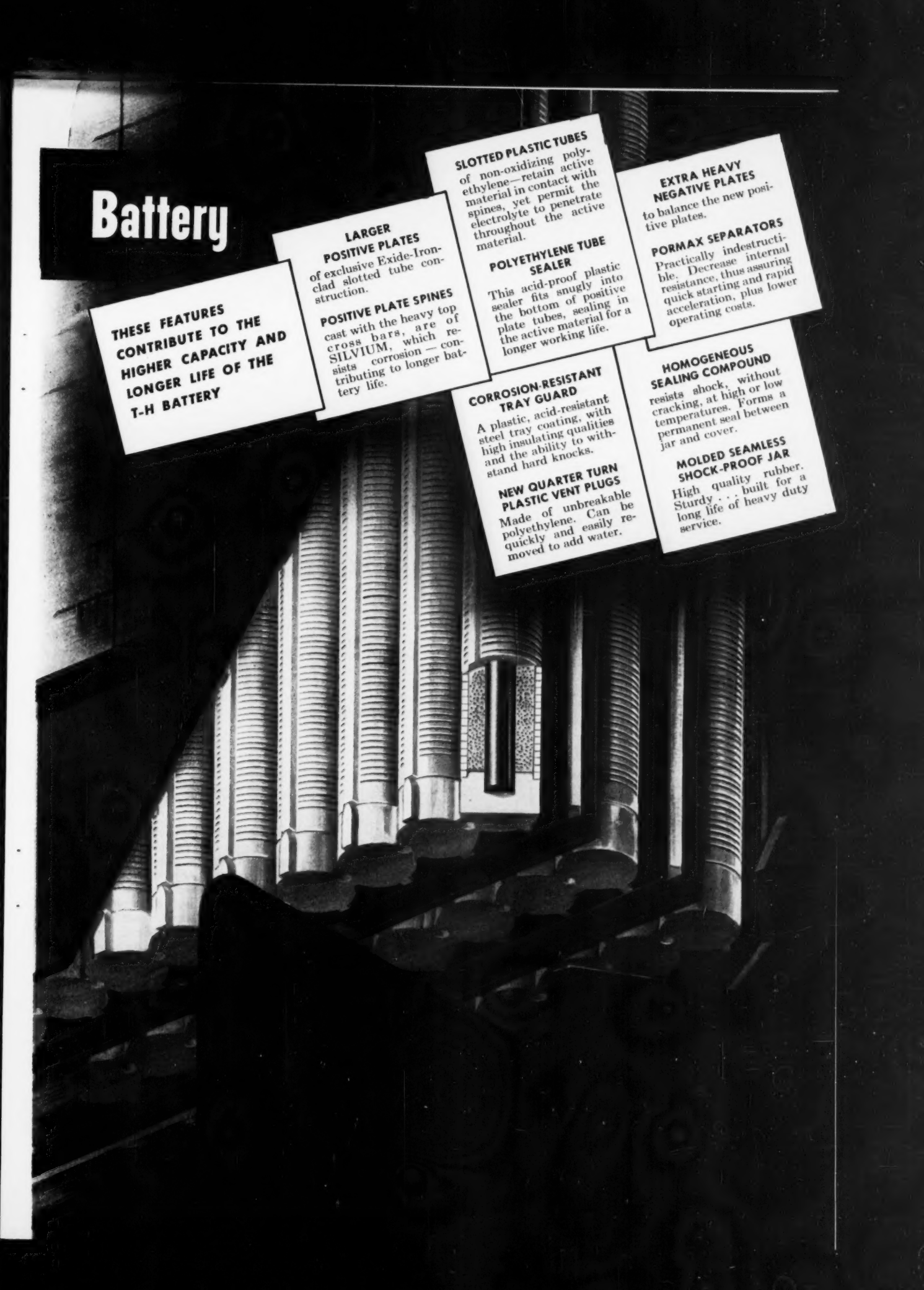
Thrifty Hauler

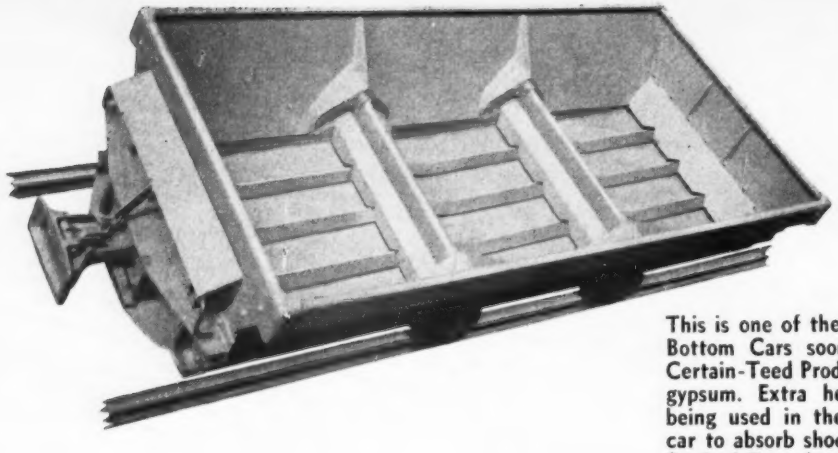
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 2

Exide Batteries of Canada, Limited, Toronto

1888—DEPENDABLE BATTERIES FOR 65 YEARS—1953

"EXIDE", "EXIDE-IRONCLAD", "SILVIUM", "PORMAX", *Reg. T.M. U.S. Pat. Off.*


Battery
THESE FEATURES CONTRIBUTE TO THE HIGHER CAPACITY AND LONGER LIFE OF THE T-H BATTERY
LARGER POSITIVE PLATES
of exclusive Exide-Ironclad slotted tube construction.
POSITIVE PLATE SPINES
cast with the heavy top cross bars, are of SILVIUM, which resists corrosion — contributing to longer battery life.
SLOTTED PLASTIC TUBES
of non-oxidizing polyethylene—retain active material in contact with spines, yet permit the electrolyte to penetrate throughout the active material.
POLYETHYLENE TUBE SEALER
This acid-proof plastic sealer fits snugly into the bottom of positive plate tubes, sealing in the active material for a longer working life.
EXTRA HEAVY NEGATIVE PLATES
to balance the new positive plates.
PORMAX SEPARATORS
Practically indestructible. Decrease internal resistance, thus assuring quick starting and rapid acceleration, plus lower operating costs.
CORROSION-RESISTANT TRAY GUARD
A plastic, acid-resistant steel tray coating, with high insulating qualities and the ability to withstand hard knocks.
NEW QUARTER TURN PLASTIC VENT PLUGS
Made of unbreakable polyethylene. Can be quickly and easily removed to add water.
HOMOGENEOUS SEALING COMPOUND
resists shock, without cracking, at high or low temperatures. Forms a permanent seal between jar and cover.
MOLDED SEAMLESS SHOCK-PROOF JAR
High quality rubber. Sturdy . . . built for a long life of heavy duty service.



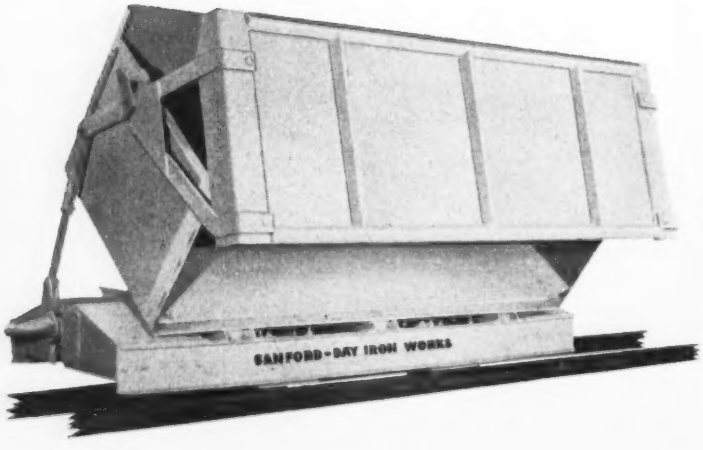
This is one of the S-D Automatic Drop Bottom Cars soon to be installed by Certain-Teed Products Corp. for hauling gypsum. Extra heavy steel plates are being used in the construction of this car to absorb shock loads. It is another Sanford-Day development toward extending the life of cars in tough service, to increase haulage efficiency and reduce maintenance cost.

New Mine Cars Built by Sanford-Day

Regardless of Your Car

We show you these four Sanford-Day Mine Cars, just recently completed, because they are examples of Sanford-Day's experience and know-how in practical car design and dependable construction. Here are cars built for the hardest service known in the mining industry.

These cars will also give you an idea of why so many metal and non-metallic mine operators are turning to Sanford-Day for their mine car requirements.



In many mines the Granby Side Dump Car is the required method of haulage. Here is a Sanford-Day built Granby Car, designed for practical construction, with reinforcing angles and extra supporting members where needed to increase the life and service of the car. This car was built for the LePanto Consolidated Mining Co., Philippine Islands.

SANFORD-DAY IRON WORKS,

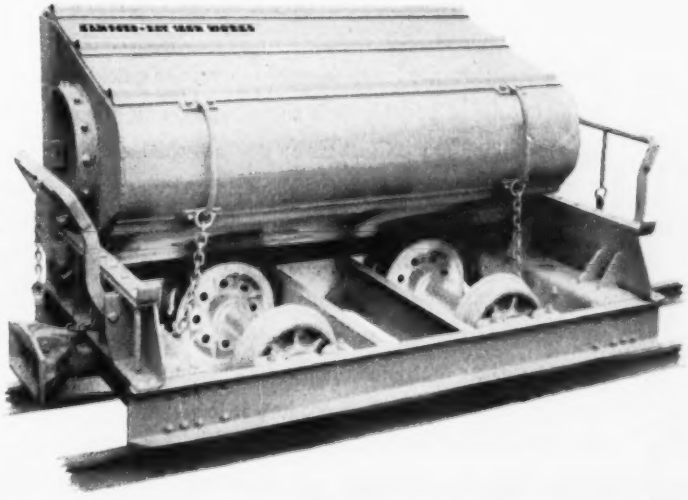
Here is one of the S-D Automatic Drop Bottom Cars to be put in service this year by the U. S. Potash Company at its Carlsbad mine. We built this car of one-half inch steel for heavy duty performance. They will haul potash non-stop because S-D Automatics dump on the move.

for Metal and Non-Metallic Mining.

Requirement, We Build It.

These operators, like yourself, are cost-minded! They know that skimpy fabrication is false economy. Consequently, they are installing Sanford-Day Cars because of their superior construction . . . with extra welding . . . extra rivets and extra reinforcing where extra strength should be . . . cars designed and built up to service requirements for longer life and less maintenance.

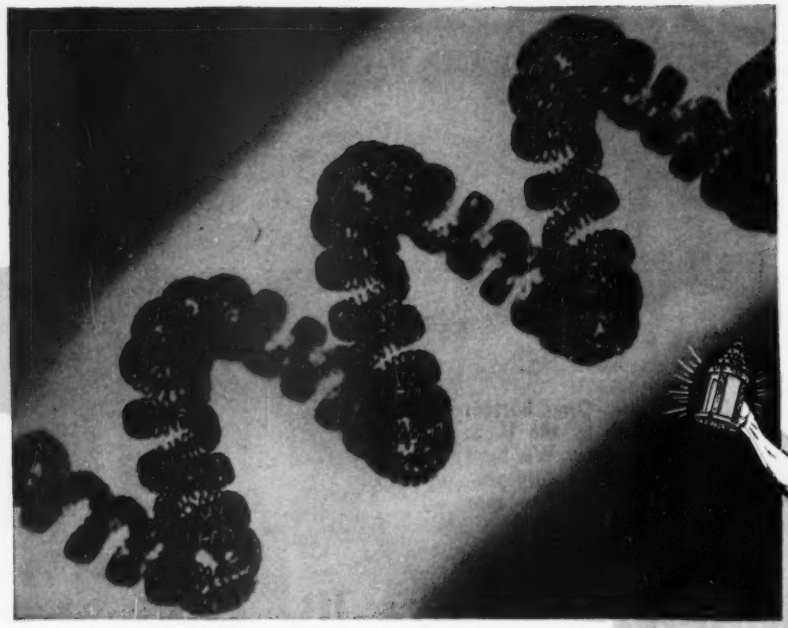
Regardless of the type of car you need, we build it . . . and you'll discover that an investment in Sanford-Day built cars will be money well spent.



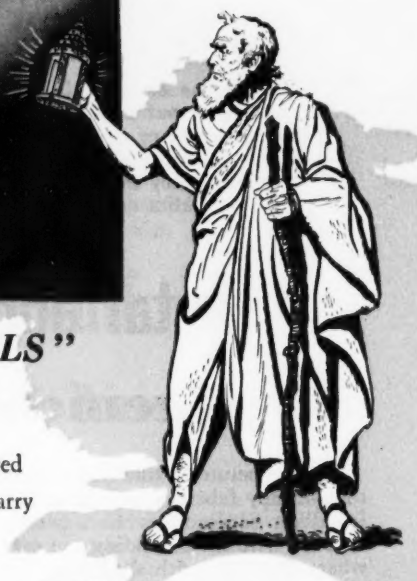
We are building S-D Rocker Cars, similar to the one shown here, for several mine operations. In many ore mines where the Rocker Car is the most economical solution to the haulage problem, the Sanford-Day Rocker Car is recognized for its ability to take the extreme punishment required by these cars.

KNOXVILLE, TENN.

After 50 years of leadership in the industry, Sanford-Day still devotes its entire capacity to the production of mine cars. Most improvements in mine cars originate with this company.



Shown at the left is a view of the triple-coil tungsten wire used in many modern fluorescent lamps. (Photo courtesy General Electric Lamps)



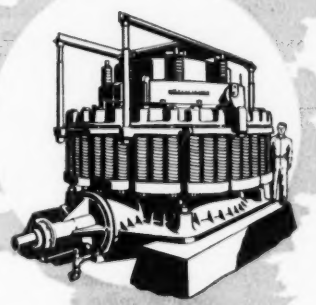
The "ARISTOCRAT OF RARE METALS" might have helped Diogenes . . .

If *TUNGSTEN*, the *"aristocrat of rare metals"*, had been discovered in his time, the Greek Cynic, *Diogenes* might have been able to carry a much brighter lamp to aid in his search for an honest man. For among the many contributions of this metal to modern civilization is the tungsten filament which gives a quality of artificial light otherwise unattainable.

Due to low grade characteristics, and the hard abrasive rock in which tungsten ore is generally found, producers must attain desired particle size for maximum recovery as quickly and economically as possible. It is significant to note the use of SYMONS® Cone Crushers by many of the large tungsten producers . . . who find these crushers particularly suited to tungsten ore reduction because of maximum utilization of crushing surfaces against the highly abrasive material, with minimum wear.

Thus, in tungsten operations . . . *as in all of the great ore and industrial mineral operations the world over* . . . SYMONS Cone Crushers are relied upon to efficiently produce great quantities of finely crushed product at low cost.

NORDBERG MFG. CO., Milwaukee, Wisconsin



SYMONS Cone Crushers...the machines *that revolutionized crushing practice*.. are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter—in capacities from 6 to 900 tons per hour.

C153

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

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SYMONS . . . A REGISTERED NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD.

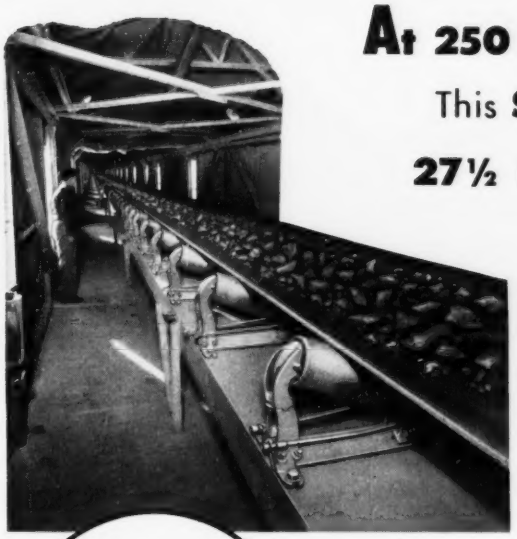
SYMONS PRIMARY CRUSHERS

GRINDING MILLS

MINE HOISTS

SYMONS VIBRATING BAR GRIZZLIES and SCREENS

DIESEL ENGINES



At 250 to 1000 TONS per Hour,

This S-A Equipment Has Moved

27½ MILLION TONS of ORE

S-A conveying equipment, featuring an S-A Amsco Feeder, which has required neither repair nor replacement for its ten years of operation, has moved more than 27½ million tons of ore at this Arizona copper mine. S-A engineers have a wealth of practical experience to draw upon. And at their command are the most complete and most modern line of conveying equipment and manufacturing facilities. It will pay you to consult with these S-A specialists regarding your own conveying operations. No obligation.

S-A CONVEYING Systems

Concentrator conveyor, 48 inches wide and 1200 feet long, delivers crushed ore to secondary crushing plant. Top picture is of the 42 inch conveyor over ore bins. This is 1200 feet long—is discharged by a power-driven belt tripper.

Belt Conveyors
Belt, Pan and Plate Feeders
Ship Loading Boom Conveyors
Stacking Conveyors
Storage and Reclaiming Systems
"Natural Frequency" Vibrating Conveyors
REDLER Conveyor-Elevators
ZIPPER Conveyor-Elevators
Conveyor Belt Cleaners
Headshaft Holdbacks
Grizzlies and Screens
Centrifugal Pilers
Bin Gates and Tunnel Gates
Car Pullers and Spotters
Bucket Elevators
Skip Hoists
SEALMASTER Ball Bearing Units

Write for a bulletin on any of the above.

STEPHEN S-A DAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

From Cyanamid Research

Additional Applications of Cyanogen Compounds in Base-Metal Flotation

AERO DEPRESSANT #675
A New 600 Series Reagent

This noteworthy addition to the 600 Series of Cyanamid Reagents and Processes is a highly selective depressant for metallic sulphides. It provides better control and more accurate separation than reagents heretofore available for many lead-zinc, copper-lead, copper-zinc, etc., ores. It can be used both in bulk float or for selective separations. Where precious metals are present, it has the added advantage of not dissolving gold or silver. While not a low-priced reagent, the unusually sharp selectivity of AERO* DEPRESSANT #675 warrants its test on any hard-to-treat sulphide, as these typical results indicate:

Normal flotation methods on a Philippine lead-copper-zinc ore produced a lead-copper concentrate containing galena, chalcopyrite, sphalerite, and pyrite. Treatment of this concentrate with AERO DEPRESSANT #675 gave these results:

	ASSAYS %		RECOVERY	
	Pb	Cu	Pb	Cu
Lead-Copper Conc.	46.9	8.9	100.0	100.0
Lead Concentrate	76.6	1.5	92.3	9.8
Copper Concentrate	8.4	18.41	7.3	90.2

On an African lead-copper-zinc ore in which the copper minerals are enargite, tennantite, bornite and chalcocite, the usual lead-copper concentrate was treated with AERO DEPRESSANT #675. Subsequently, the resulting lead concentrate was cleaned with additional AERO DEPRESSANT #675 to produce a cleaned lead concentrate, a lead tailing and a copper concentrate as follows:

	ASSAYS %		RECOVERY	
	Pb	Cu	Pb	Cu
Lead-Copper Conc.	53.8	15.3	100.0	100.0
Lead Concentrate	75.8	1.7	94.0	7.4
Lead Cleaner Tail	35.0	18.4	2.4	4.5
Copper Concentrate	6.5	45.5	3.6	88.1

AMERICAN *Cyanamid* COMPANY

* Trade Mark

AERO CYANIDE to Increase Zinc Recovery from Tarnished or Slimy Ores

Recent comparative tests in the Cyanamid Mineral Dressing Laboratory indicate that the addition of a small amount of AERO® Brand Cyanide can substantially increase recovery and improve grade on tarnished zinc sulphide ores and tailings and on slimy zinc ores.

In this typical series of tests on jig tailings and dump ores, Cyanamid metallurgists added a half-pound of Aero Brand Cyanide per ton of feed to the mill; conditioned with Copper Sulfate and SODIUM AERO-FLOAT® Promoter and frothed with Pine Oil. Control tests on these samples were identical, except for the omission of cyanide. These spectacular improvements in recovery and grade were obtained:

ASSAYS % ZINC WITH AERO CYANIDE

	Calc. Heads	Conc.	Tails	Zinc Recov.
Jig Tailing #2	4.54	59.86	0.10	96.3
Jig Tailing #3	3.86	59.59	0.06	97.4
Jig Feed #4	13.86	64.82	0.29	96.4
Tailing Dump #5	5.07	62.62	0.02	97.6
Tailing Dump #6	3.93	58.35	0.07	96.5

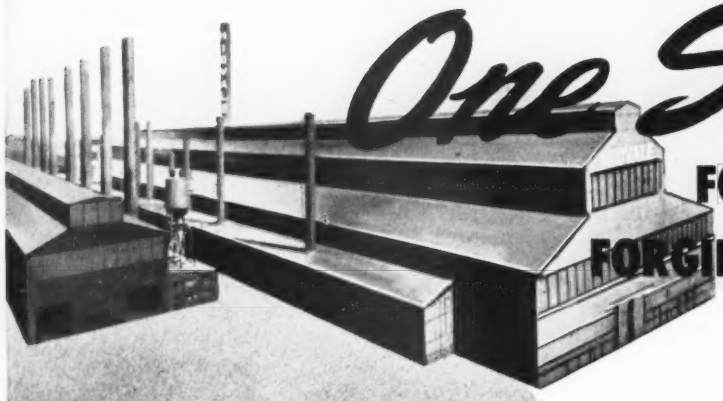
ASSAYS % ZINC WITHOUT AERO CYANIDE

	Calc. Heads	Conc.	Tails	Zinc Recov.
Jig Tailing #2	3.44	47.08	0.20	93.1
Jig Tailing #3	3.73	62.50	0.32	90.6
Jig Feed #4	12.65	62.22	0.54	94.4
Tailing Dump #5	5.29	61.80	0.77	85.2
Tailing Dump #6	3.07	59.85	0.73	76.0

An important supplier of Cyanide for over thirty years, Cyanamid has continuously explored the development of Cyanogen Compounds and Processes for their application to mineral beneficiation. Through a world-wide interchange of information flowing to and from the Cyanamid Mineral Dressings Laboratory, Cyanamid Field Engineers are kept continuously informed of all advances in milling methods, reagent combinations, processes and application techniques. Supplemented by the original research and testing in Cyanamid Mineral Dressing Laboratory, this constitutes the most extensive reservoir of ore-dressing data available to mills everywhere as part of Cyanamid's Complete Metallurgical Chemical Service.

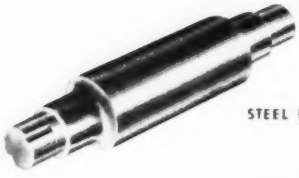
CN

MINERAL DRESSING DIVISION
30 ROCKEFELLER PLAZA, NEW YORK 20, NEW YORK

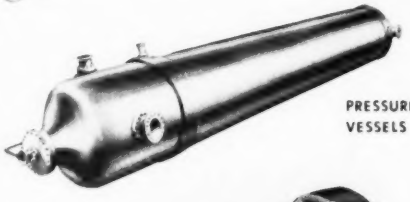


One Source

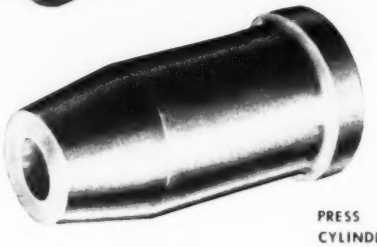
FOR "SPECIFICATION" FORGINGS AND CASTINGS



STEEL ROLLS



PRESSURE VESSELS



PRESS CYLINDER

RINGS

Name your requirements . . . show us your blueprints . . . and Midvale engineers and craftsmen working with the finest equipment will produce the forgings or corrosion and heat resisting castings you need.

Midvale can assure you of the finest in craftsmanship, precision and ultimate performance. Whether it is weldless gear rings for turbine speed reduction . . . cylinders for hydraulic presses . . . weldless high-pressure vessels for oil refining, gas reactions and steam generation or hardened and ground steel rolls for cold rolling steel, aluminum, copper, brass, zinc, foil, paper, linoleum, plastic and rubber, Midvale engineers can help you design them. Midvale craftsmen will build them to your most exacting specifications. Put your forging and casting problems in our hands . . . you'll be satisfied with the results.

THE MIDVALE COMPANY

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OFFICES: NEW YORK • CHICAGO • PITTSBURGH
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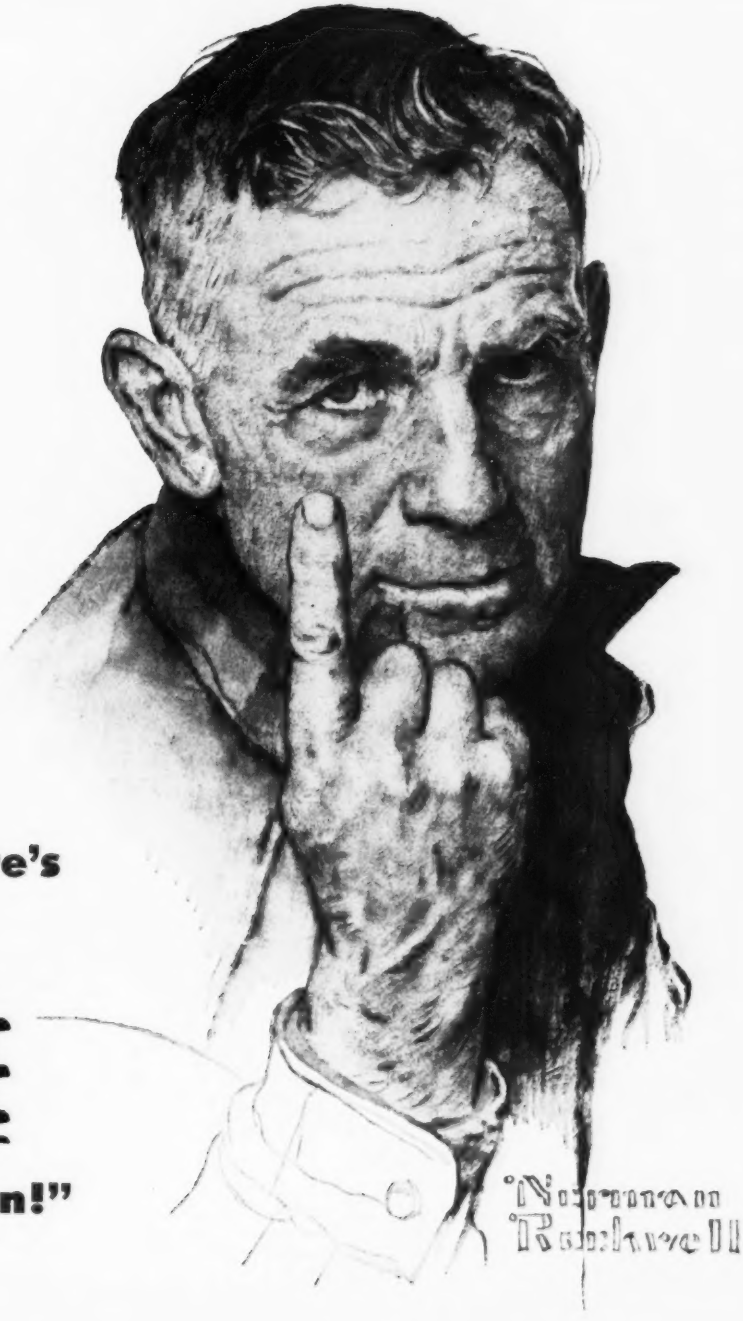
MIDVALE

Custom Steel Makers to Industry

PRODUCERS OF FORGINGS, ROLLS, RINGS, CORROSION AND HEAT RESISTING CASTINGS



"There's only ONE reason!"

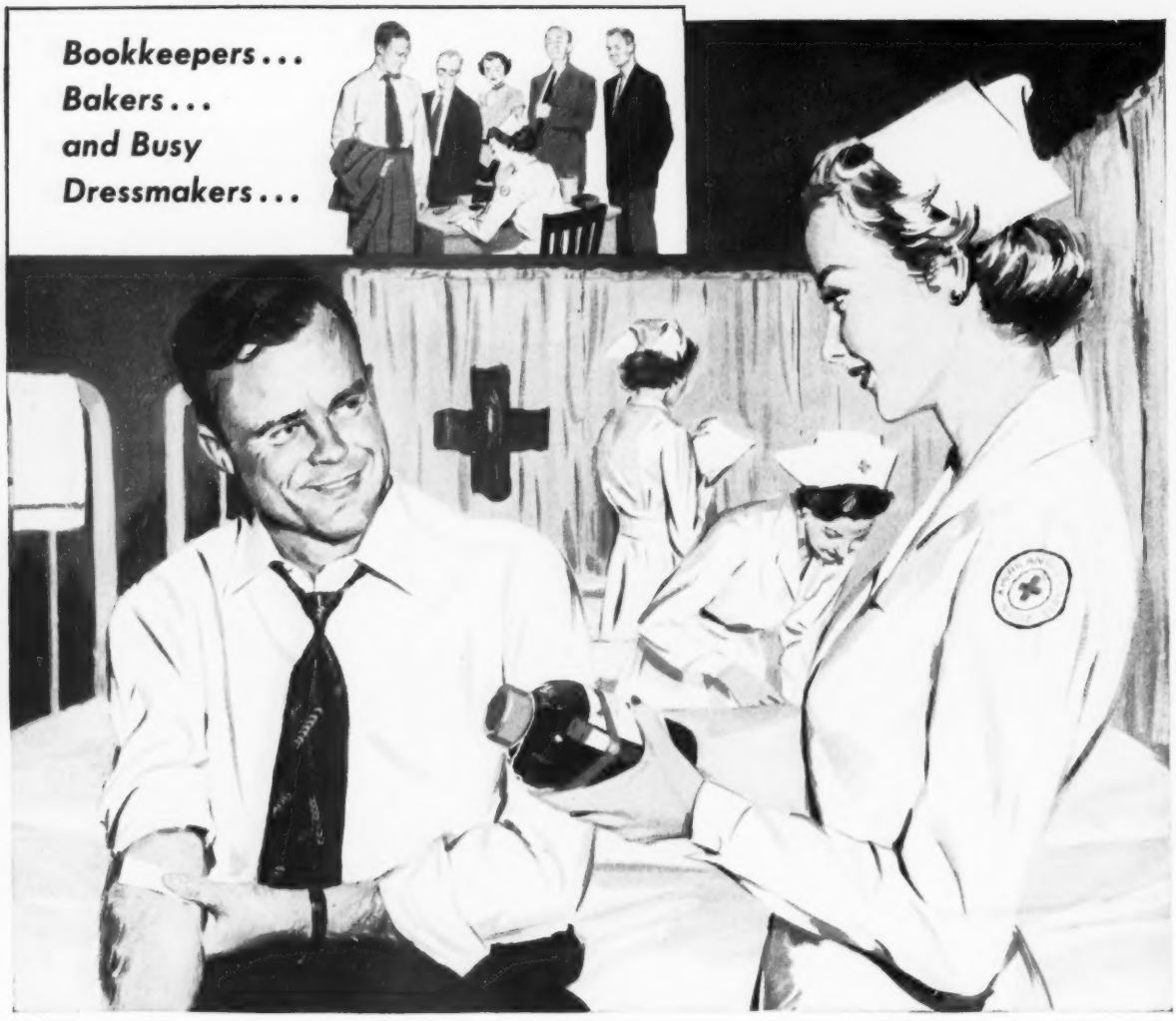
IT'S JUST THAT SIMPLE. There's only one reason in the world why 2 out of 3 wire rope users in the mining field prefer Roebling wire rope . . . *it costs a lot less on the job than any other.*

For maximum wire rope efficiency and economy, call your nearest Roebling office for a Field Man. He'll recommend the best ropes for your requirements.

ROEBLING

A subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1930 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.



Americans Are Rolling Up Their Sleeves!

YES, ALL KINDS OF PEOPLE ARE GIVING BLOOD SO THAT OUR WOUNDED MAY LIVE!

• Today, the blood of a Boston bookkeeper may be flowing through the veins of a wounded kid from a Kansas farm . . . the blood of a pretty Southern housewife may have saved the life of a grizzled leatherneck. For, blood is blood, a God-given miracle for which there is no substitute . . . and when a man's life hangs in the balance and blood is needed, there is nothing else to take its place!

Right now the need for blood is urgent. In hospitals —at home and overseas— many men require four and six transfusions during delicate operations. And the blood *must be there*—when it's needed. So give the most precious gift of all—*your* blood!

Be assured that giving blood is neither difficult nor distressing. And what a thrill there is in knowing that you've performed a really unselfish act! So call your local American Red Cross today and make an appointment. And tell your friends and neighbors about your experience. Let them share the wonderful feeling Americans get when they roll up their sleeves—and give blood.

But—

WHAT HAPPENED TO THAT PINT OF BLOOD YOU WERE GOING TO GIVE?

Call Your American Red Cross Today!

an ACCO product

LAY-SET Preformed WIRE ROPE

SPECIFY... HAZARD ...the GREEN Strand Brand

Here's something your best friend will tell you— that he gets better service from HAZARD "Green Strand" Wire Rope

There's a Mighty Good Reason!

● Sure, HAZARD is made to standard specifications but there is one thing that tells you the moment you look at it that it's the best wire rope made—and that's the GREEN STRAND.

It will cost you more in the long run if you just order wire rope—where you can get it the cheapest. Just like anything else, the experience and integrity of the manufacturer are the real reason why you get longer service and better value from HAZARD Green Strand.

HAZARD Green Strand is made from the best materials, with precision, by oldtimers in the wire rope business. Then only certain constructions, carefully checked in use, are recommended for specific jobs you do. It's this combination of quality wire rope and correct recommendations that saves you money on all your wire rope purchases.

● Don't just ask for wire rope—specify, *and get*, HAZARD Green Strand Preformed Wire Rope. See your local HAZARD distributor or write our Wilkes-Barre office today for recommendations covering the equipment you operate.

makers of ACCO Registered WIRE ROPE SLINGS

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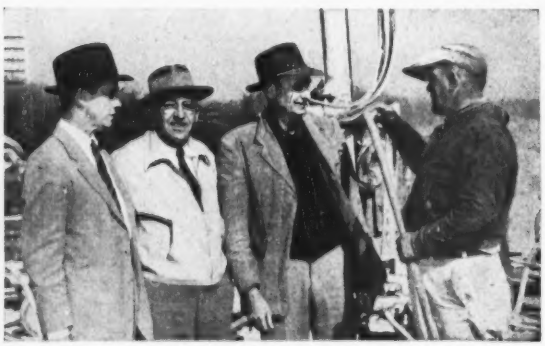
HAZARD WIRE ROPE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex.
Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

LONGER STEEL, COMING UP!—In drilling some 750,000 ft of blast holes in limestone, the contractor has relied largely on hard-hitting wagon drills to put down holes as deep as 24 ft—using detachable bits on rods of Bethlehem hollow drill steel.



ON THE FIRING LINE—(left to right) E. T. (Hap) Houlihan, Mgr., Contractors Service and Supply Co., Winchester, Ky. His firm supplies and reconditions the Bethlehem hollow drill steel. Next is Alex Manson, L & N Engineer in charge of the project; John Callaway, Project Sup't, Codell Construction Co.; Casey Jones, Drilling Foreman for Codell.

Moving 1 million cu yd of rock for railroad yard at Nashville

The job of tearing up and moving 2½ million cu yd of material—about half of it rock—is nearing completion at Nashville, Tenn., where a modern and greatly enlarged freight yard is taking shape. It will serve the combined needs of the Louisville and Nashville Railroad and the Nashville, Chattanooga and St. Louis Railway.

When completed, the Radnor yard will accommodate 6,576 cars—more than double the existing capacity. The project includes the most modern facilities for servicing locomotives and cars, fast communications systems, 90 miles of additional tracks and other improvements to speed the forwarding of cars.

Excavation and grading contracts are held by Codell Construction Co., Winchester, Ky., and Oman Construction Co., Nashville. Using detachable bits on rods of Bethlehem hollow drill steel, Codell has drilled about 750,000 ft of hole in medium-hard limestone. Grading and structures are slated for completion in April.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM HOLLOW DRILL STEEL

Send him into a stope or raise or crosscut.

Send him with a Gardner-Denver S48 Drill and FL2A Feed Leg Mounting.

The time he saves handling this lightweight equipment — plus the drilling pace set by the power-packed S48 — will enable him to do a man-sized drilling job every day. See Gardner-Denver Bulletin HHD-11 — or write for a copy today.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
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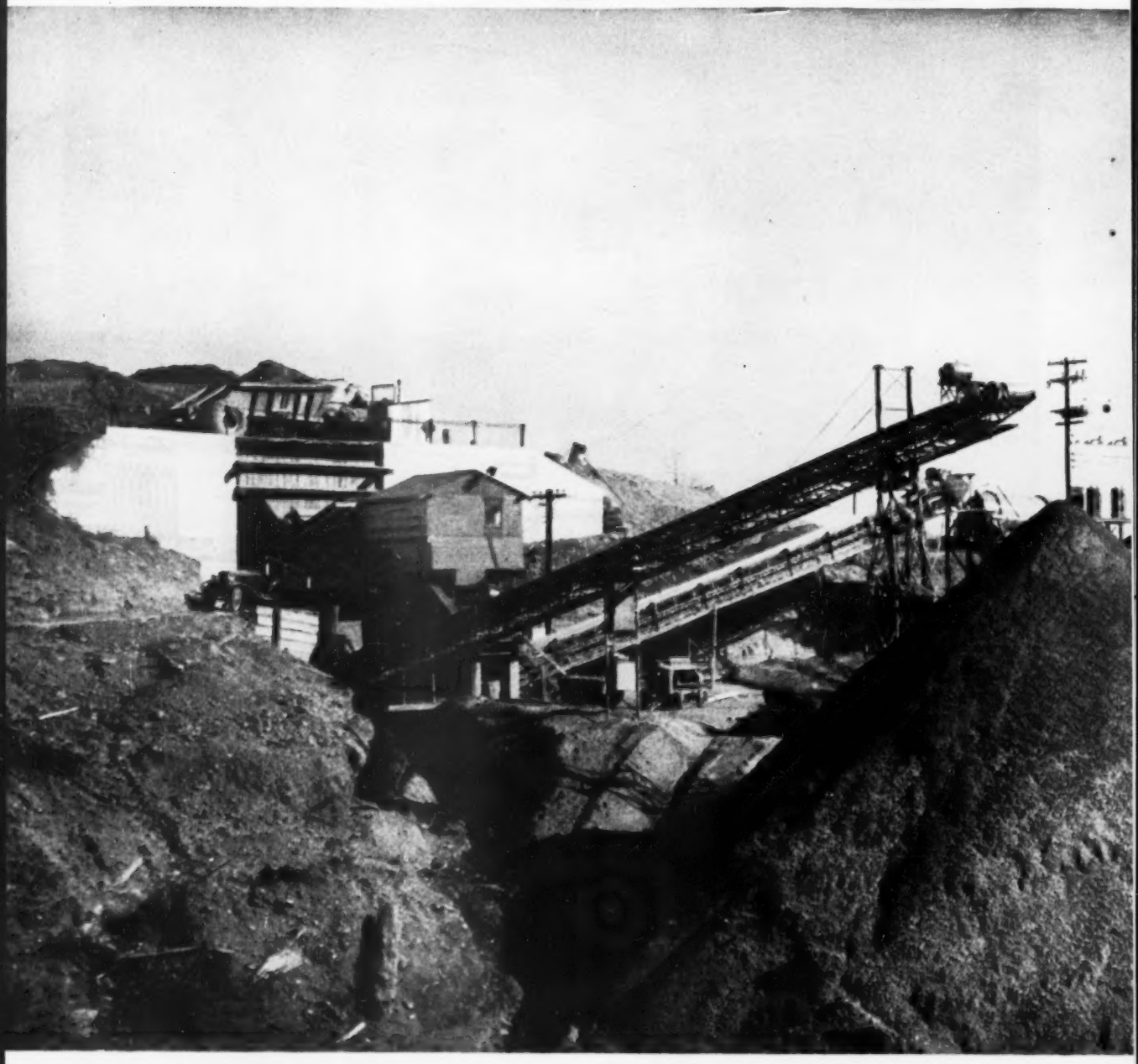
14 Curity Avenue, Toronto 13, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

When your operating margin is narrow...

that Pioneer Edge



BUY BOTH!
HIGHER OUTPUT
LOWER UPKEEP

Pioneer

Continuflo EQUIPMENT

makes profit more certain

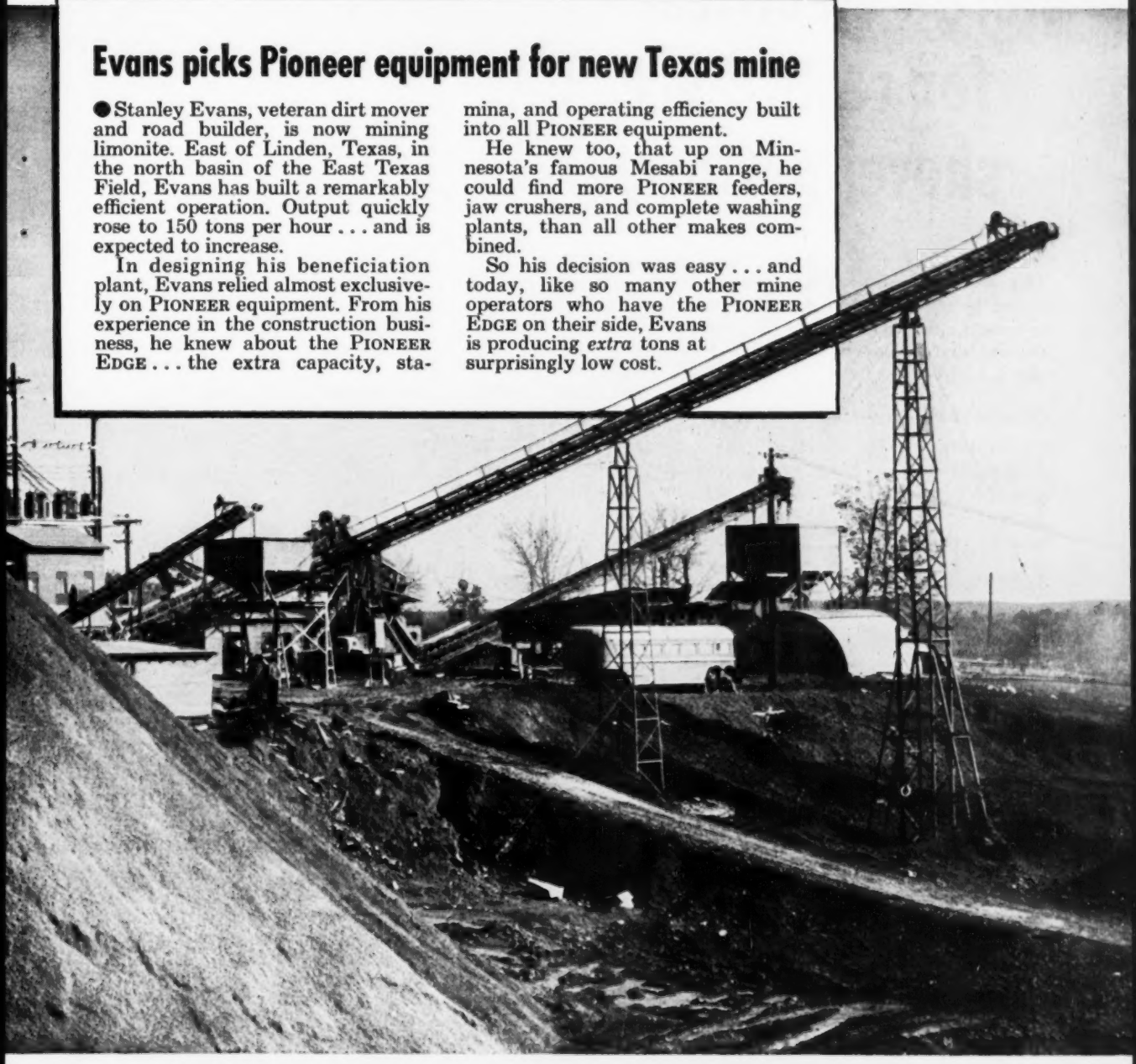
Evans picks Pioneer equipment for new Texas mine

● Stanley Evans, veteran dirt mover and road builder, is now mining limonite. East of Linden, Texas, in the north basin of the East Texas Field, Evans has built a remarkably efficient operation. Output quickly rose to 150 tons per hour . . . and is expected to increase.

In designing his beneficiation plant, Evans relied almost exclusively on PIONEER equipment. From his experience in the construction business, he knew about the PIONEER EDGE . . . the extra capacity, stamina, and operating efficiency built into all PIONEER equipment.

He knew too, that up on Minnesota's famous Mesabi range, he could find more PIONEER feeders, jaw crushers, and complete washing plants, than all other makes combined.

So his decision was easy . . . and today, like so many other mine operators who have the PIONEER EDGE on their side, Evans is producing *extra* tons at surprisingly low cost.



These Pioneer Units Keep Costs Low for Evans

Beneficiation plant at the S. E. Evans Construction Company mine (shown above) was designed by George Hawkins, Evans production manager. It includes the following Pioneer units.

- 5' x 12' MESABI VIBRATING SCREEN
- 30" x 42" JAW CRUSHER
- 3 4' x 12' 3-DECK VIBRATING SCREENS
- 4' x 8' VIBRATING SCREEN
- 72" x 16' SCRUBBER
- 40" x 22" TRIPLE ROLL CRUSHER
- MISCELLANEOUS CONVEYORS AND HOPPERS

PIONEER ENGINEERING WORKS
1515 Central Avenue • Minneapolis 13, Minnesota
(SUBSIDIARY OF POOR & COMPANY • CHICAGO)

● Please send me information on the equipment checked.

☐ JAW CRUSHERS	☐ WASHING PLANTS	☐ MECHANICAL FEEDERS
☐ ROLL CRUSHERS	☐ BITUMINOUS PLANTS	☐ VIBRATING SCREENS
☐ ROCK PLANTS	☐ APRON FEEDERS	☐ BUZZER SCREENS (LIGHT DUTY)
☐ GRAVEL PLANTS	☐ ORO FEEDERS	☐ CONTINUFLO CONVEYORS

*Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

Here's electrical equipment for record-breaking shovel performance!

This Westinghouse-equipped Marion shovel set a new world's record by removing over 1.5 million cubic yards of overburden in just one month at an Eastern coal-stripping operation. In addition, another Westinghouse-equipped shovel at the same mine stripped over 1.3 million yards.

Over a million yards a month averaged during 1951

To attain this average, the shovel moved an average of over 2,000 yards per hour by moving 33.91 cubic yards per pass with an average time of 60.43 seconds per complete cycle. This fast operation is the result of the carefully co-ordinated design of Westinghouse generators, motors and Rototrol® control.

Smooth, controlled operation increases production

The Rototrol control is the "brain" of the shovel operation. When fast action is necessary, as during the swing, Rototrol "forces" the electric drive. The responsive action is quick, fluid and smooth. This prevents any shocks to the equipment and speeds up your operation. Rototrol also makes it impossible to overstrain the machinery. For example, during the crowd operation, the motors will stall out rather than force the bucket and cables.

Dependability of equipment reduces down time

The durability of the equipment is another reason for the record-breaking performance. The Rototrol, for example, is a simple, sturdy device that can be serviced right in the field. The M-G sets have special spherical-sleeve bearings which compensate for misalignment and permit operation even at tilts of 15°. The motors are designed and built to insure maximum durability.

Call Westinghouse on your next project

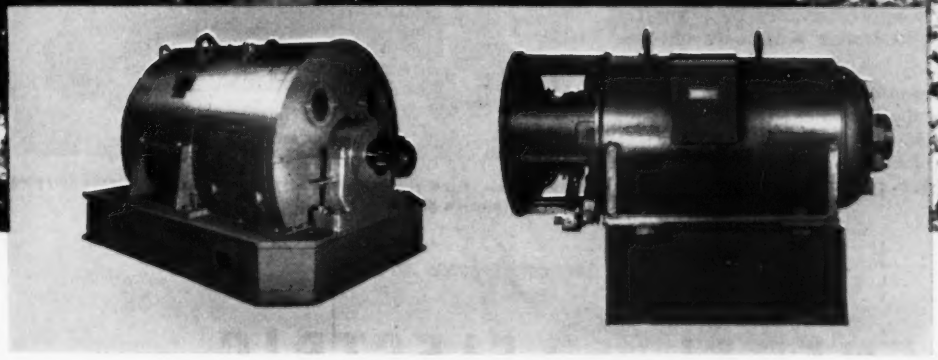
This is a good example of the performance Westinghouse builds into electrical equipment for mining. The next time you're planning a project, call in Westinghouse early. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-94879

YOU CAN BE SURE...IF IT'S

Westinghouse

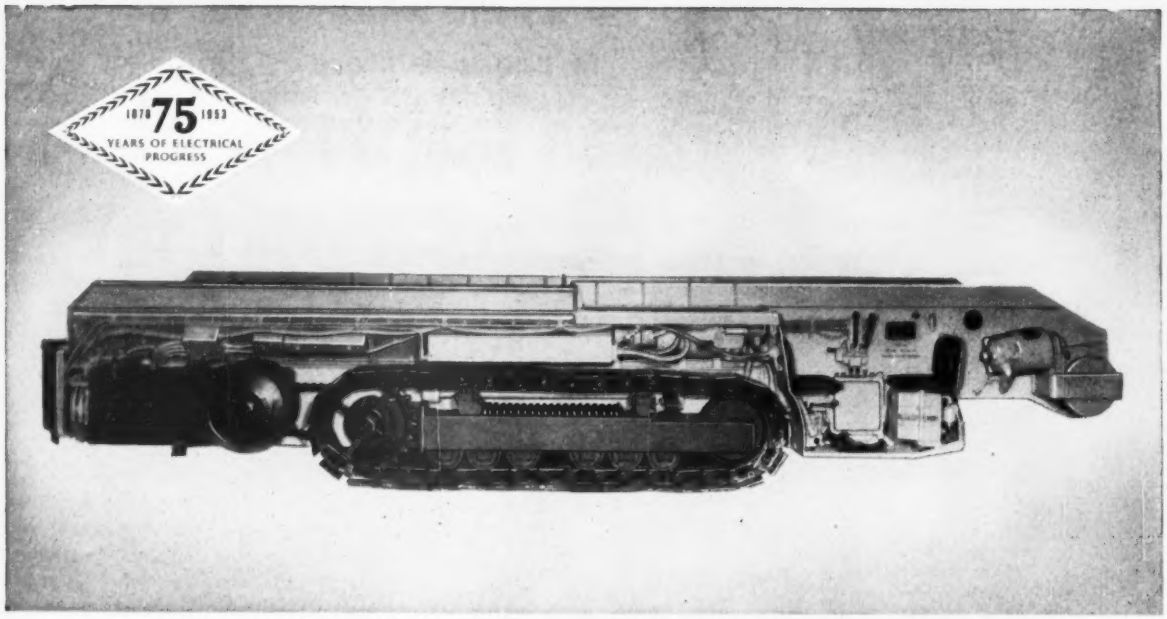
EQUIPMENT FOR
THE MINING INDUSTRY

They did what you can do to produce more



Westinghouse shovel motors are specially constructed to give you years of continuous operation even under the most rugged conditions. They are designed to help you get the most yardage out of your next shovel or dragline.

Rototrol is the master intelligence governing the shovel operation. It gives a quick, smooth responsive action to your operator's slightest control movement. This prevents shocks to equipment. The fast action cuts the digging cycle—speeds up production.



G-E CABLE-REEL SHUTTLE CAR IS HIGHLY MANEUVERABLE, HAS 14-FOOT TURNING RADIUS

Quantity Production of G-E Shuttle Car Under Way

Extensive Field Tests Prove Its Versatility, Easy Maintenance Under Rigorous Mining Conditions

Eighteen months ago the G-E cable-reel shuttle car went into service under actual mining conditions to prove its worth. After heavy-duty service under all types of conditions—wet bottoms, narrow passageways, sharp turns—the verdict of operators was enthusiastic. Now, with quantity production under way, you can take advantage of this timely tool for more efficient, economical mining.

Crawler Treads Allow Large Capacity

Crawler treads on the G-E shuttle car make possible a wide conveyor, great carrying capacity, and excellent maneuverability either in passageways or at the loading machine. Ground pressure with the empty car is only 10 pounds per square inch. When fully loaded, using sideboards, the car still has only 20 pounds per square inch ground pressure.

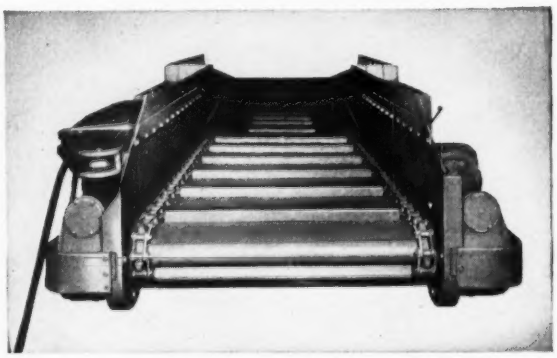
Only 42″ high, the shuttle car has a carrying capacity ranging from 190 cubic feet to 300 cubic feet (with 12″ sideboards). This is approximately 30% greater capacity than is now obtainable with cars of conventional design.

Dual Seating Arrangement on Shuttle Car

All motors and control devices meet U.S. Bureau of Mine's specifications. A dual seating arrangement with two conveniently-located control handles permits operation in either direction with maximum visibility and comfort.

Construction of the G-E shuttle car is rugged and *simple* throughout. The two driving motors are readily accessible and easy to maintain. Working parts are easy to get to, easy to service.

Investigate today the many advantages and economies that can be obtained with the new G-E track-laying cable-reel shuttle car. For full information, contact your nearest G-E sales office. *General Electric Co., Schenectady 5, N. Y.* 120-61



End view of G-E shuttle car shows wide conveyor and large carrying capacity made possible by crawler treads.

You can put your confidence in—

GENERAL ELECTRIC

WORM GEARING—Universal in its application—affords advantages for almost every power transmission job. Select worm gear units to meet your need from the complete Cleveland line.

Photo courtesy Engineering and Mining Journal.

Easy picking on CLEVELAND-driven table

"Scalping off" lumps of impure metallic ore from this picking table is easier and more efficient because the belt moves evenly and without delays. It is kept running uniformly day in day out, year after year, by a Cleveland worm gear speed reducer.

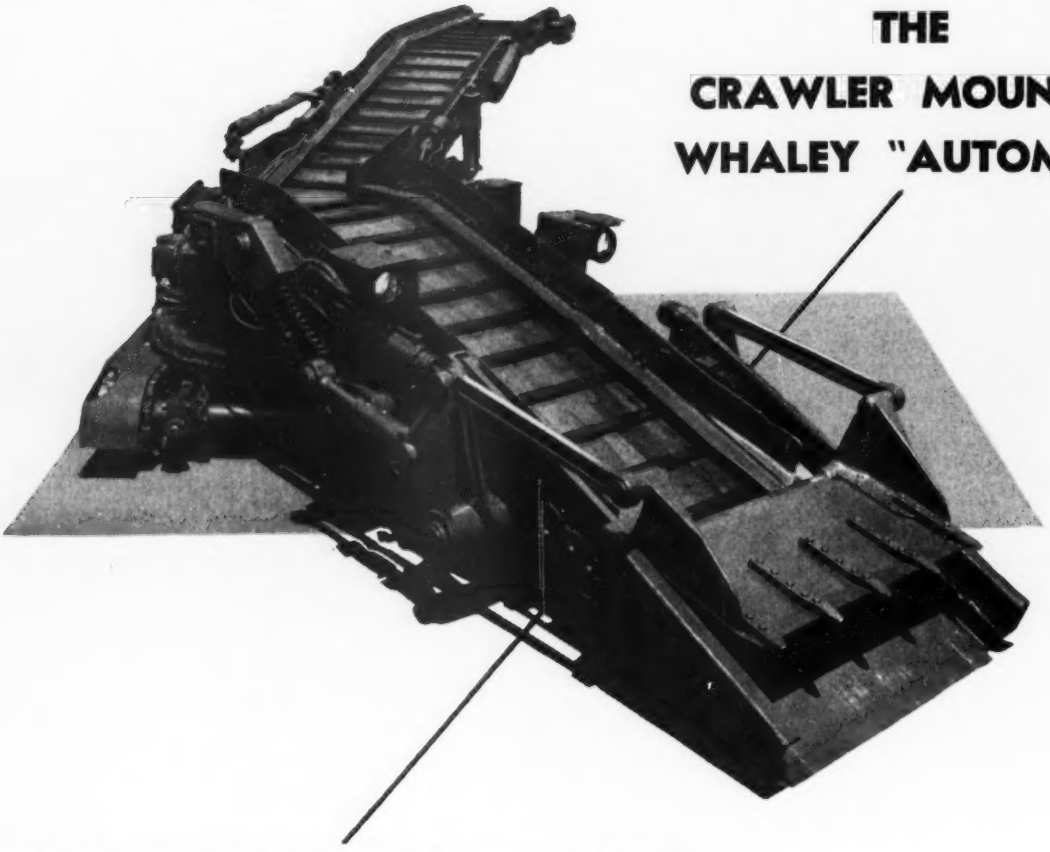
Clevelands—designed for peak loads and top speeds—perform with sure, steady, even movement above or below ground, in all kinds of weather, under all operating conditions For over a quarter century, Clevelands have faithfully served the mining industry—driving shuttle cars, picking tables, conveyors, hoists and other equipment on which a right-angle drive is needed.

Clevelands are compact and powerful, have a minimum of moving parts, consequently, a greater freedom from repairs. If your plans call for a foolproof, trouble-free right-angle drive, investigate Cleveland. Write for new Catalog 400. The Cleveland Worm & Gear Company, 3281 East 80th St., Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

★ . . . to meet the needs of metal and non-metallic mining for greater production . . . . .

THE CRAWLER MOUNTED WHALEY "AUTOMAT"



Metal mining men who have recognized our track-mounted Whaley "Automat" for its superior mechanical ability to do a more efficient job consistently in rock loading, have often suggested that we put the "Automat" on a Crawler Mounting. This we have done to meet the needs of metal and non-metallic mining for greater production at reduced cost.

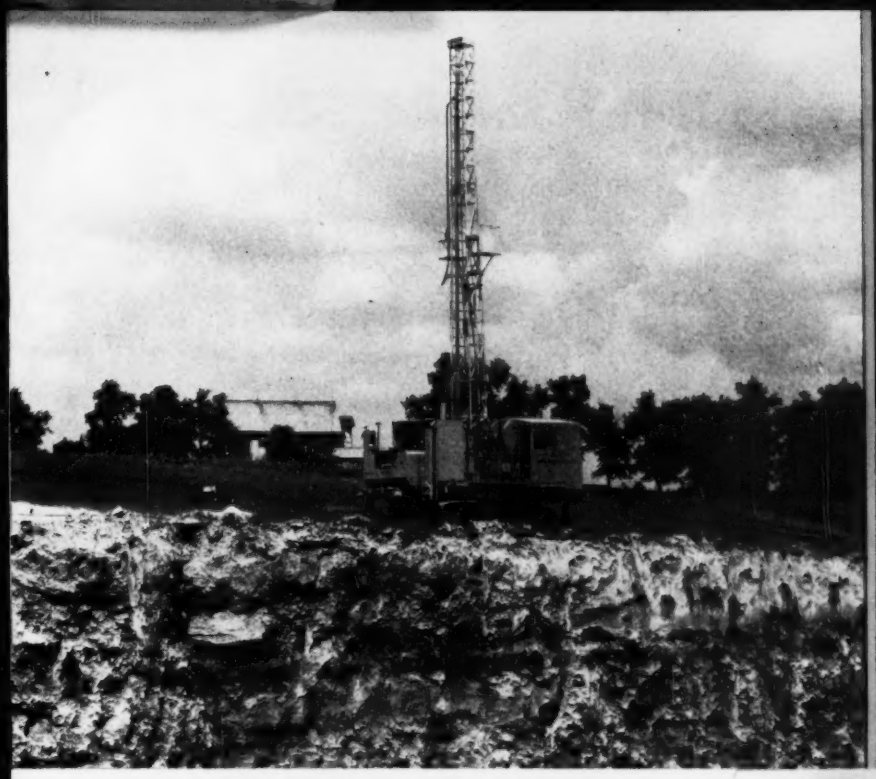
Its straight-on, natural shovel action loading head has been unmatched for loading efficiency. But, just as important—back of the shovel is a first class machine . . . built to operate effectively for uninterrupted service and at minimum maintenance cost. A mechanical loader that is designed and constructed to take the punishment of loading rock or ore in its stride.

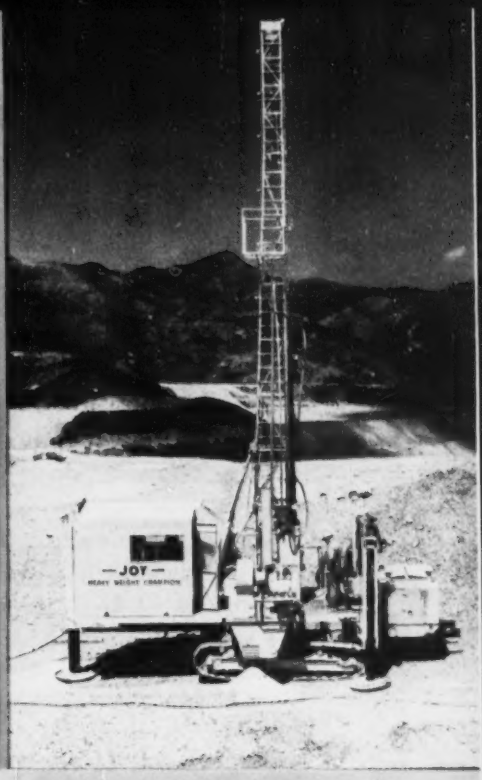
You'll find the Crawler Mounted Whaley "Automat" a powerful machine for consistent service and big production! Write to us for complete information. Also ask about the new Whaley Crawler Mounted Transfer Car, companion equipment to the Crawler Mounted "Automat".

MYERS-WHALEY COMPANY

MECHANICAL LOADERS EXCLUSIVELY SINCE 1908

KNOXVILLE, TENNESSEE





For COAL STRIPPING or OPEN CUT MINING

The JOY Champion (58-BH) really is in a class by itself. We'll be glad to *prove* to you, with actual case records, that no other drill even comes close for fast, economical blast-hole drilling.

It's a continuous-type rotary drill that employs a tri-cone, roller type bit to pressure-cut the rock, while an air blast cools the bit and removes cuttings. Drilling dry means no water lines or water problems, winter or summer. Bit life is exceptionally long, and the rigid drilling stem, plus hydraulic control of feed pressure and rotation speed, prevents bit "wander". You finish every hole you start—straight, smooth-walled holes that are easier and safer to load and assure top blasting efficiency.

The JOY Champion trams at 5 mph, sets up quickly with 3-point hydraulic leveling, and drills vertical holes (5⅝" to 7⅞" dia.) to any normal depth required. Mediumweight and Heavyweight models—each with electric motor or diesel drive, as desired. ● Let us quote on *your* conditions.

there's nothing on the market to match the

JOY CHAMPION

BLAST HOLE DRILL

Consult a Joy Engineer

W&D CL-4032

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

strip MORE overburden for LESS cost

with the BIG RED TEAM

BUCYRUS-ERIE SCRAPER and INTERNATIONAL TD-24 TRACTOR

haul bigger payloads "Boiling-action" loading of Bucyrus-Erie scrapers directs dirt to center of bowl, breaks up chunks to eliminate voids and assures a full and compact load.

make more trips per day You get greater hauling speed and easier, faster maneuverability from features like these: gooseneck design for short turning radius . . . big tires for extra flotation . . . low center of gravity for increased stability on rough and uneven terrain.

dump fast and clean . . . because positive rolling ejection requires less power and lets you dump in higher tractor gear for quicker action on spot dumps or spreading. Apron is adjustable to secure best dumping of any material.

more working time . . . because the Big Red Team needs less service and maintenance. Lube points are easy to see, easy to get at . . . sealed wheel bearings extend greasing intervals to 500 hours . . . cable lasts longer — doesn't require frequent replacement.

BUCYRUS-ERIE COMPANY
South Milwaukee, Wis.

29T53C

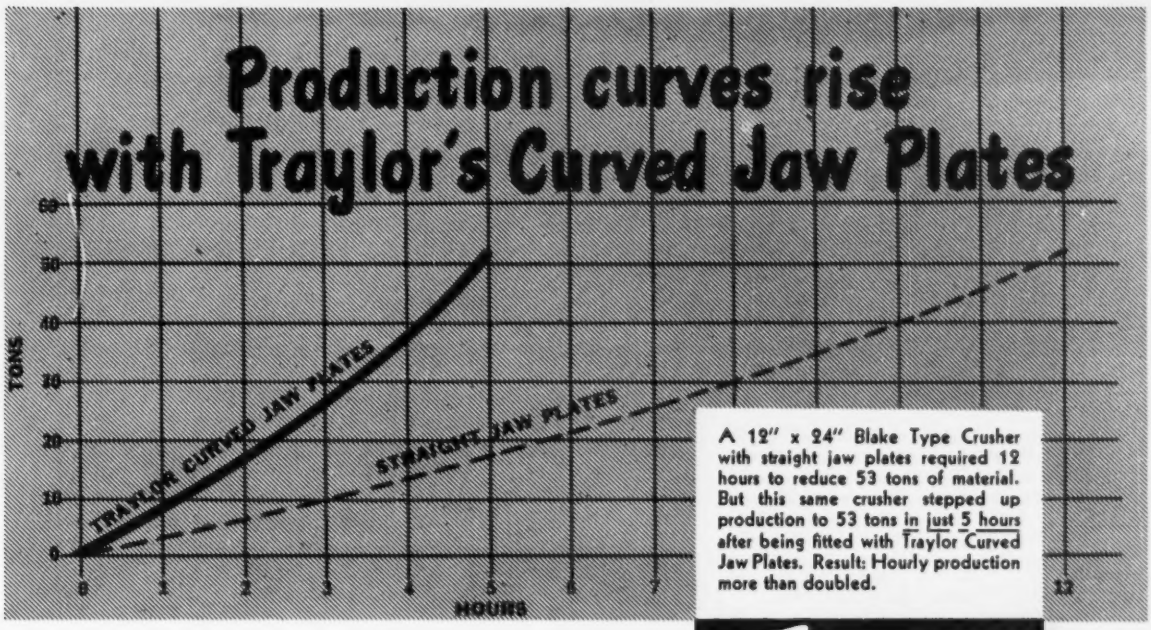
BUCYRUS ERIE

Find out more about these B-type Bucyrus-Erie scrapers . . . . . .

MODEL	CAPACITY	
	STRUCK	HEAPED
	22 cu. yd.	27½ cu. yd.
	16 cu. yd.	21 cu. yd.
	10 cu. yd.	14 cu. yd.

See Your INTERNATIONAL Industrial Tractor Distributor

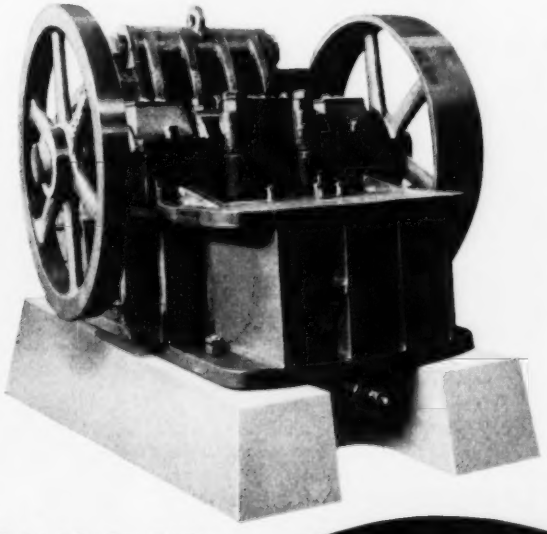
Production curves rise with Traylor's Curved Jaw Plates



A 12" x 24" Blake Type Crusher with straight jaw plates required 12 hours to reduce 53 tons of material. But this same crusher stepped up production to 53 tons in just 5 hours after being fitted with Traylor Curved Jaw Plates. Result: Hourly production more than doubled.

Less time out for maintenance
Greater tonnage by the hour

Traylor
JAW CRUSHERS



Traylor Jaw Crushers, with their curved jaw plates, put a two way squeeze on rising costs. In dozens of actual installations Traylor Curved Jaw Plates have outlasted conventional plates 3 to 1. Traylor curved jaw plates wear evenly over all . . . retain their original curved surfaces indefinitely. In addition, these Traylor Curved Jaw Plates produce greater capacities . . . even at finer settings. Each succeeding zone in the crushing chamber is of greater capacity, so choking and packing are practically eliminated. Investigate Traylor Jaw Crushers today by sending for free Bulletin. Coupon will bring your copy.

TRAYLOR ENGINEERING & MFG. CO.
552 MILL ST., ALLENTOWN, PA.

Sales Offices: New York • Chicago • San Francisco
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P.Q.

PICK the right Jaw Crusher for *your* needs from one of Traylor's four different types. Each is built in a wide range of sizes. Feed openings range from 8" x 12" to 60" x 84"; Capacities from 3 to 1000 tons per hour.

A **Traylor** LEADS TO GREATER PROFITS

O.K. Let me see complete specifications and descriptions on Traylor Jaw Crushers.

Name: _____

Position: _____

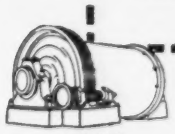
Company: _____

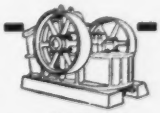
Address: _____ State: _____

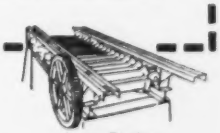
Primary Gyratory Crushers

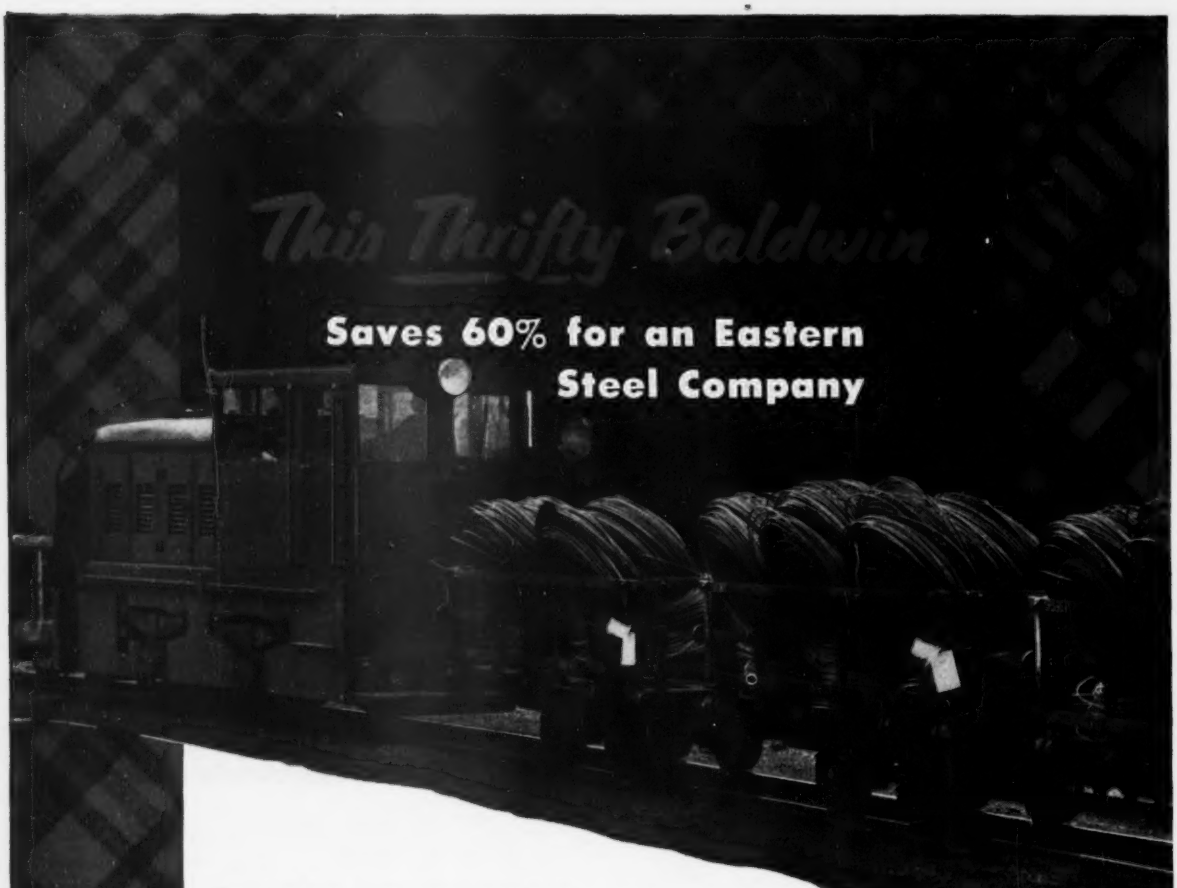
Rotary Kilns

Secondary Gyratory Crushers


Ball Mills


Jaw Crushers


Apron Feeders



Saves 60% for an Eastern Steel Company

Typical of the performance records of thrifty Baldwin industrial locomotives is a report from an eastern steel company, where a Baldwin diesel switcher is employed in materials handling averaging 120 tons a load.

"We can take in *one* trip, materials that previously may have required 2 to 3 trips to transport from one part of our plant to another."

This represents a saving in materials handling costs of approximately 60% by using a Baldwin diesel to do the job.

This steel company also reports: "Maintenance has not been a problem."

"From the standpoint of handling ease, the diesel locomotive is safer and easier to operate."

Because Baldwin industrial locomotives are thrifty . . . representing more economical materials handling, lower maintenance, greater operating flexibility . . . they can check mounting haulage costs in your plant.

If *you* are interested in more economical switching operations, write today for Bulletin DMH-300 to:

Dept. 1608, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

BALDWIN · BLH · LIMA-HAMILTON

BALDWIN - LIMA - HAMILTON

INDUSTRIAL LOCOMOTIVES

...they're thrifty!

Here's how ROCKMASTER® reduces noise

The noise your neighbors hear . . . and complain about . . . is air blast. It is the noise of wasted explosive energy that escapes into the air before it has done its job on the burden. Such noise is difficult to avoid when holes are spaced too closely and detonation begins at the top. This waste of power occurs because the explosives force seeks the path of least resistance.

By allowing initiation at the bottom of the holes, the ROCKMASTER Blasting System can keep the explosives force under prolonged confinement . . . as shown in the above photos taken at the height of four different ROCKMASTER blasts. Each photo shows considerable movement of burden with practically no escaping gases.

To see how the ROCKMASTER Blasting System can improve your blasting efficiency and reduce noise at the same time, send for your copy of the booklet, "Overburden Blasting Techniques."

The North Jersey Quarry Company erected this greenhouse at its Millington operation, 400 feet from the working face, to prove that its blasts don't break windows. The reduced noise and vibration of the ROCKMASTER *system helps them improve community relations.*

ATLAS

ATLAS EXPLOSIVES

"Everything for Blasting"

ATLAS POWDER COMPANY, WILMINGTON 99, DELAWARE

Offices in principal cities

"For branch lines I use a half-hitch—pulled up tight

"The detonating wave travels along the Primacord at about four miles per second. At that speed it must pass from the trunk line into each branch 'down-hole' line, where it detonates the charges.

"You can see why these branch connections are important—why they all have to be *tight* and at right angles to the trunk line. And that's where textile-covered Primacord has a big advantage. You can easily make these branch line connections with simple half hitch knots that can be drawn up tight and will stay that way."

Ask your explosives supplier or write for further facts to

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut
Also Safety Fuse Since 1836

Reinforced Primacord (for deep holes and resistance to abrasion) connects with the **Plain Primacord** trunk line with a simple half hitch, pulled up tight. The textile covering grips securely.

Use the brand of Primacord that meets your needs exactly. In addition to those mentioned, there are: **Wire Countered Primacord,** for deep, ragged holes; and **Plastic Reinforced Primacord,** for deep holes and unusual wet conditions.

Use PRIMACORD®

The PROVED and APPROVED DETONATING FUSE

YOU PICK THE SPOT

...WE'LL MAP IT!

WITH the airborne magnetometer busy AERO crews are helping to uncover big new finds of iron, chrome, titanium and other minerals in widespread corners of the world. And our dependable topographic maps are speeding mining development, putting projects months ahead of schedule.

Wherever you're exploring, wherever your mining project, get the benefit of AERO's more than a million miles of mapping experience. AERO can save you upwards of one-half the cost of slow ground surveys.

AERO
SERVICE CORPORATION
PHILADELPHIA 20, PENNSYLVANIA
Oldest Flying Corporation in the World

AIRBORNE MAGNETOMETER SURVEYS • PRECISE AERIAL MOSAICS
TOPOGRAPHIC MAPS • PLANIMETRIC MAPS
RELIEF MODELS • SHORAN MAPPING

CANADIAN AERO SERVICE, LTD., OTTAWA, is our affiliate

"Conveyors keep 'em coming with this drive team cracking the whip"

"Here's a mighty important step in our production flow. A breakdown on this conveyor jams up an entire line . . . spells real trouble! That's why we installed Westinghouse Life-Line Gearmotors and Controls to handle the job. Past experience has shown us that this drive team will give continued, dependable service. We know they'll keep our output flowing smoothly without letup.

"All the gears are specially heat-treated with tapered hardness from surface to core to provide tough, wear-resisting teeth. They are hobbed and shaved after heat-treatment for quiet, smooth operation. All this adds up to precision gearing with maximum load carrying capacity. Supports for the antifriction bearings are mounted directly in the housing, not in end brackets, thereby providing permanent alignment of working parts and maximum overhung load capacity. As for the motors themselves, they're Life-Line too. Have all the proved Life-Line features, such as factory-sealed bearings, that need no lubrication—ever, and steel construction that's so vital to dependable operation and long service life.

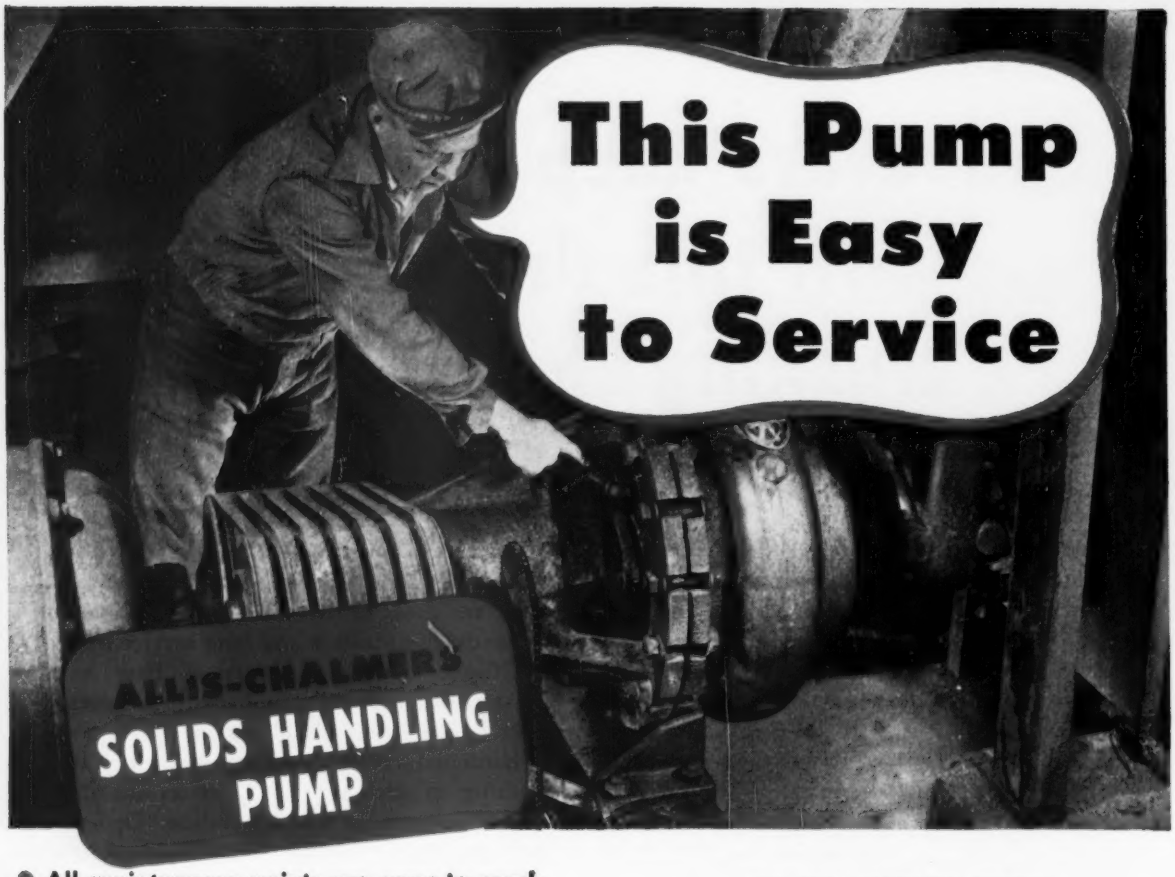
"Notice the Life-Linestarters! They have what it takes to stand up under constant usage. Each contact assembly pivots on a knife-edge of hardened steel. This reduces wear and leaves nothing to stick or jam. Contacts are silver tipped and are protected with the "De-ion®" Arc Quenching Chamber which snuffs out those destructive arcs. All in all, these starters make a perfect matched control for the gearmotor. They're rough, tough and dependable. Just what we need on these important control jobs.

"These Westinghouse Gearmotors and Controls really form a drive team we can rely on. They'll do the same for you. Just call your Westinghouse representative for full details, or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania."

J-07305-A

YOU CAN BE SURE...IF IT'S

Westinghouse



This Pump is Easy to Service

- **All maintenance points are easy to reach.**
- **Can be taken down and returned to service in less than a half hour.**
- **Many parts interchangeable between different pump sizes.**

Here's a pump that maintenance men like. The Allis-Chalmers solids handling pump is solidly built to stand rough solids handling service. And it's easy to work on. Notice how accessible the packing gland is. See how the casing bolts are arranged. Just loosen the nuts a couple of turns and the bolts lift out.

Wearing parts separate into easily handled units. In fact, one man can tear down an Allis-Chalmers solids handling pump, replace a part and have it back in action again *in less than a half hour*. Piping need not be disturbed unless the casing is replaced.

COMPLETE PUMPING UNIT FURNISHED

This pump is equipped with *Texrope* V-belt drive and *Vari-Pitch* sheaves. Head and capacity can be varied instantly by the turn of a crank. Allis-Chalmers can furnish the complete pumping unit — pump, motor, control and drive — assembled and ready to run.

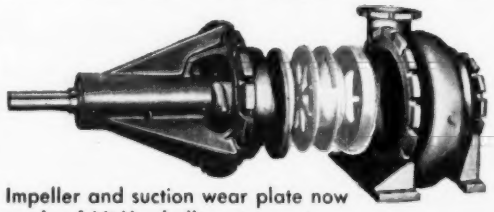
GET THE COMPLETE STORY

Every Allis-Chalmers solids handling pump is application-engineered by a specialist who knows solids handling equipment problems and how to solve them. Your nearby Allis-Chalmers representative will be glad to give you complete facts and figures on CW pump performance. Or write Allis-Chalmers, Milwaukee, 1, Wisconsin and ask for Bulletin 52B6381. A-3975

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

NOW

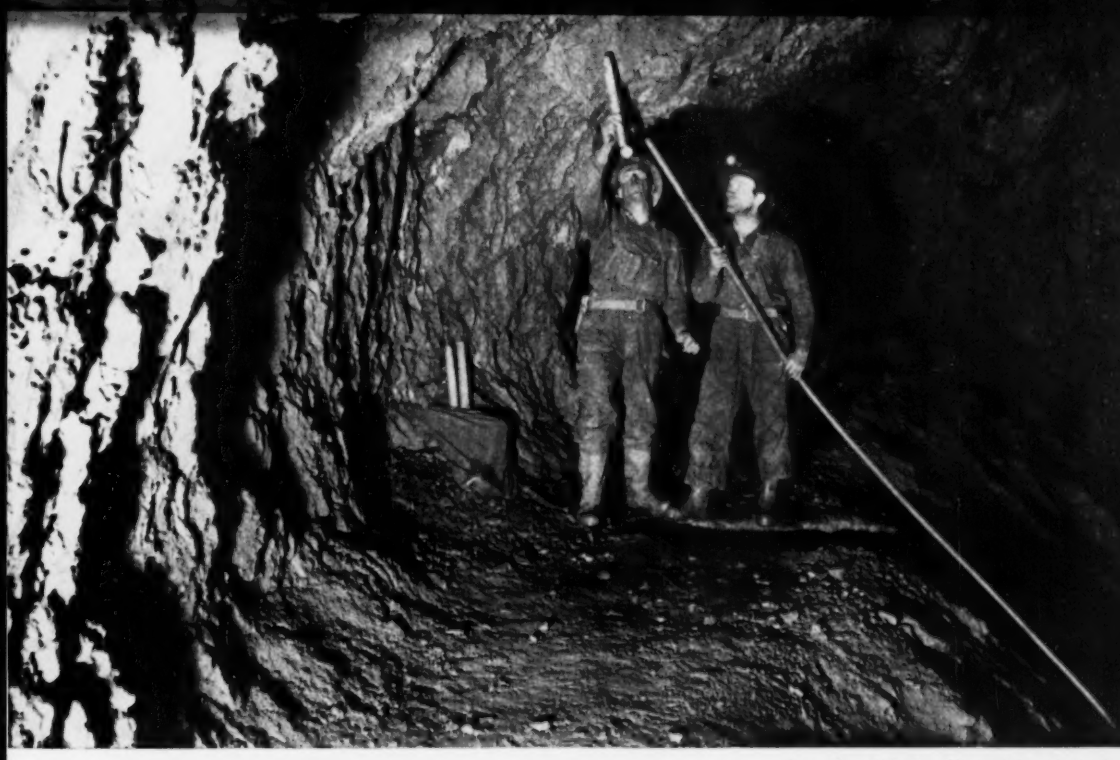
...even longer wear



Impeller and suction wear plate now made of *Ni-Hard* alloy at no extra cost. You get longer wear . . . lower pumping costs.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS



Loading "Gelex" in 24-foot hole drilled vertically upward from bench in sub-level in Bengal-Tully Mine.

Du Pont "MS" Delay Caps

REDUCE CONCUSSION . . . IMPROVE FRAGMENTATION in Michigan Iron Mine

In a typical stoping operation at the Bengal-Tully Mine of the M. A. Hanna Company at Stambaugh, Michigan, Du Pont "MS" (millisecond)* Delay Electric Blasting Caps are used both to reduce concussion and to obtain better fragmentation.

On a bench of the sub-level stope illustrated, holes are drilled 24 feet vertically upward and downward. These are loaded with Du Pont "Gelex" No. 2. Tamping is done with a pole made of "Carlon" flexible tubing. The holes are connected in straight parallel, and the blast is fired with a Du Pont Condenser Discharge Blasting Machine providing both greater dependability and safety.

This combination: "MS" Caps, "Gelex," and the Condenser Discharge Blasting Machine produce highly satisfactory results in the Bengal-Tully Mine. Improved fragmentation speeds production . . . reduces hand labor and chute blasting. The short intervals of "MS" Delay Caps do a consistently better job than regular electric blasting caps or long-interval delays. They also eliminate possibility of dynamite in the muck.

Why not put Du Pont "MS" Delay Caps to use in your own mining operation? These caps are contributing to increased operating efficiency in ore mines throughout the country and you may be able to use them to excellent advantage. Any Du Pont Explosives representative will gladly give you complete information about "MS" Delays and other Du Pont blasting supplies and accessories. E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Delaware.

*Available in 14 millisecond intervals of delay: MS-25, -50, -75, -100, -125, -150, -175, -200, -250, -300, -350, -400, -450, -500.

Superior fragmentation results from "MS" Delay Cap blast fired with Du Pont Condenser Discharge Blasting Machine.

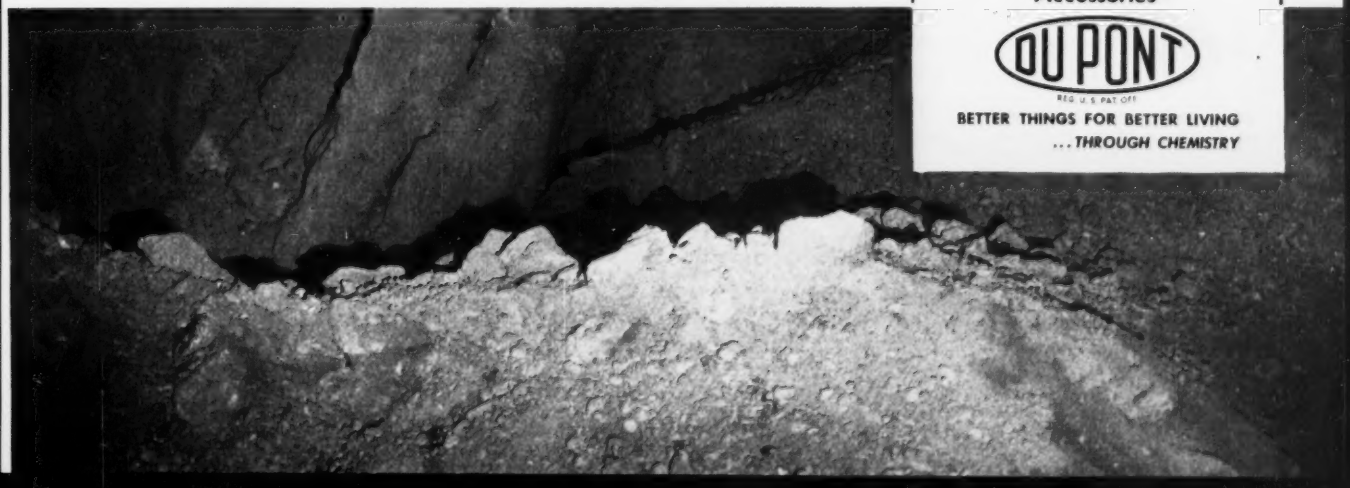
DU PONT EXPLOSIVES

Blasting Supplies and Accessories

DU PONT

REG. U. S. PAT. OFF.

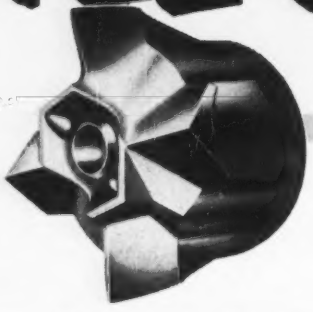
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY



Now!

TEE CEE Liddicoat Bits

[Tungsten carbide inserts]



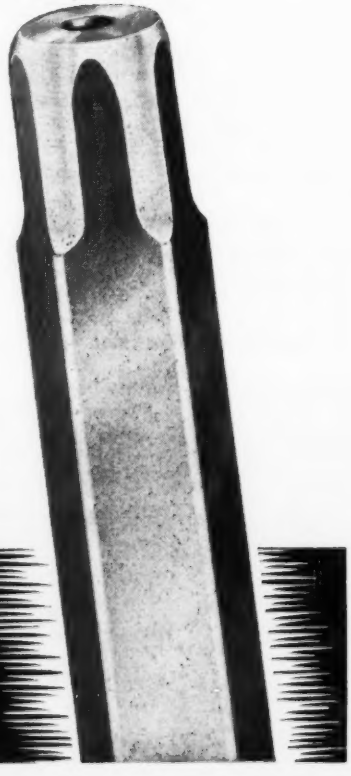
Liddicoat TEE CEE and "single use" bits both fit the same drill steel.

It's here . . . ready to go into action for you! It's the new Liddicoat Tee Cee (Tungsten Carbide insert) Bit, designed for on-the-job interchange with the famed Liddicoat Bit that is "used to destruction." Both fit the same steel. The same strong Liddicoat connection — no threads to strip — is used for both. With the new Tee Cee bit, users of Liddicoat now have a detachable bit best suited to conditions. The TEE CEE Liddicoat is the result of years of testing and research by the Western Rock Bit Manufacturing Company.

The socket of the Liddicoat TEE CEE bit is machined to an accuracy in thousandths of an inch, a degree of precision that means a stronger connection and longer bit and rod life. Flat sections — four or six — within the socket correspond with the flat sections of the drill steel — securely locking the bit to the rod.

Equipped with the new TEE CEE bit and the Liddicoat single-use bit, users have assured performance and economy in all drilling operations.

Add your name to the ever-expanding Liddicoat list of mining and contracting firms that enjoy outstanding results at lower cost. Write today for detailed information.



"Every Little Bit Counts"

Made in Salt Lake City by

WESTERN

Rock Bit Manufacturing Company

552 West 7th South • Salt Lake City 4, Utah

Cut mill operating expenses to the bone!

Install longer-lasting U·S·S LORAIN ROLLED PLATE LININGS...

Save on every ton you grind!

NO matter what you grind, U·S·S Lorain Rolled Plate Linings will produce better grinding results, more economically. They're made in easy-to-handle sections that save hours of installation time. They keep mill down-time to a minimum. They're so rugged they'll wear 'til they're paper thin without failing!

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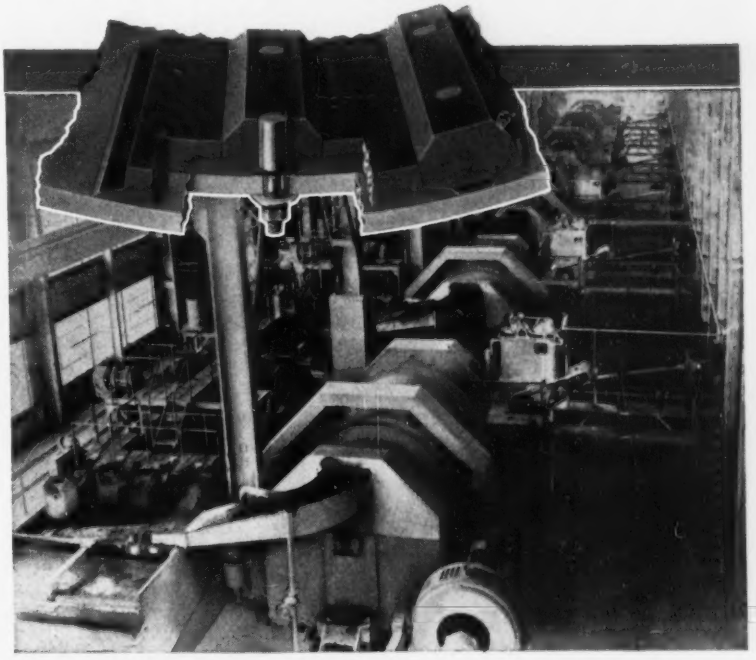
U·S·S Lorain Rolled Plate Linings are available—in the diameter, length and thickness best suited to your operating conditions—through leading mill manufacturers whose names will be furnished upon request.



Installation shows seven Allis-Chalmers' 10½' x 11' Ball Mills.

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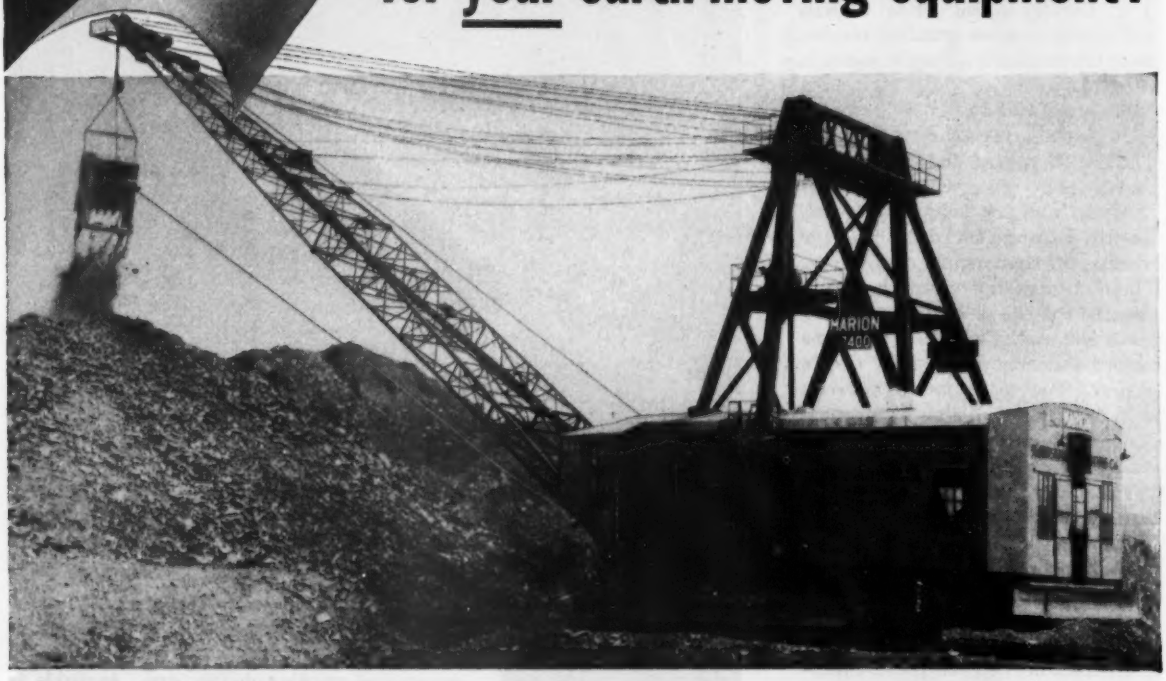
U·S·S LORAIN ROLLED PLATE LININGS AND U·S·S GRINDING BALLS

USS

3-218

UNITED STATES STEEL

How do you choose the wire rope for your earth-moving equipment?



EVERY wire rope on your stripping or excavating machinery needs a particular combination of strength, fatigue resistance, and flexibility. Hoist ropes on big power shovels need high tensile strength to absorb impact stresses and must be extremely tough to withstand constant bending over sheaves. On draglines, drag ropes must possess high strength combined with great abrasion resistance. Boom ropes must have strength plus fatigue resistance.

There's an American Tiger Brand Wire Rope that has been especially designed for every grueling rope job that you will encounter. And it pays to spend a little extra time to analyze your rope requirements carefully and determine exactly which Tiger Brand Rope is the best one to use.

Our experienced Wire Rope Engineers will be glad to help you do this. They know what every Tiger Brand Rope can do and what type of rope every job requires. Their assistance assures you of getting the *right* rope for every job; and that saves you money. Remember, the right rope often lasts up to twice as long as the wrong one. Free engineering service is available through our nearest District Sales Office or by writing to American Steel & Wire, Rockefeller Building, Cleveland 13, Ohio.

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UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
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U·S·S AMERICAN TIGER BRAND WIRE ROPE

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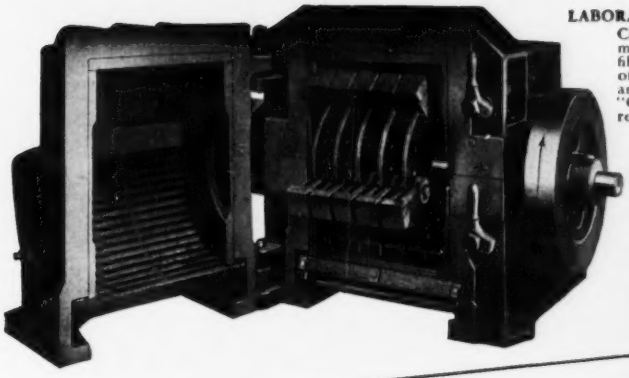
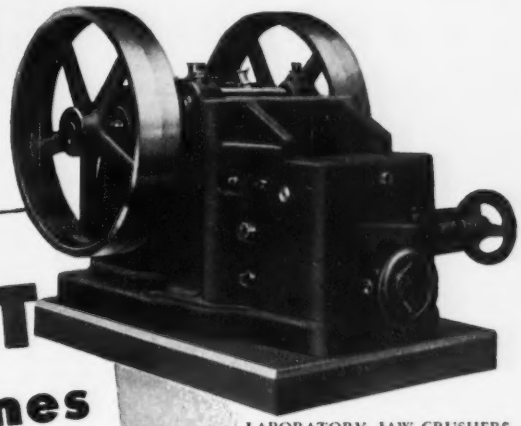


LABORATORY SWING-SLEDGE MILLS
Capable of reducing soft, moderately hard and tough or fibrous materials to any degree of fineness between 1 in. and 20 mesh. The patented "Open-Door" feature permits ready accessibility for cleaning.



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Fast - Economical - Accurate

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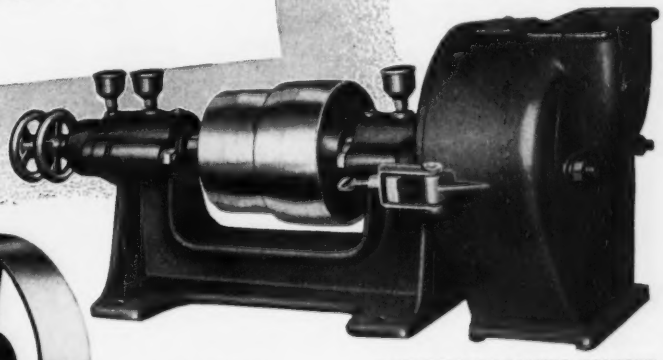
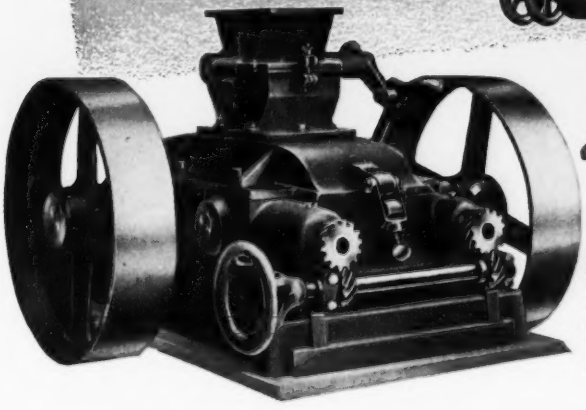
Special Roll Jaw action simplifies close regulation of the product with capacities varying from 300 or 400 lbs. per hour at finest settings, to 1000 or 2000 lbs. when opened for coarser work. Each part of the crusher is accessible for quick and easy cleaning.





LABORATORY CRUSHING ROLLS
First designed especially for laboratory sampling work, Sturtevant Crushing Rolls are used regularly in many plants where there are limited outputs. Range of output for the 8 x 5 size is from ½ in. to 20 mesh — and for the 12 x 12 size from ¾ in. to 20 mesh.

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Laboratory Sample Grinders are of the "Open-Door" disc type and are capable of very fine work, producing products as fine as 100 mesh (coarser if desired) when working on dry, friable, soft or moderately hard materials. Simply turn hand wheel to provide product regulation from 10 to 100 mesh.

The only sure way to maintain strict quality of products is laboratory control . . . and that calls for accurate sampling.

Sturtevant Laboratory Equipment meets the exacting requirements of laboratory work. They are fast and accurate . . . provide true samples.

Rugged and dependable, Sturtevant equipment actually has all the features of full size machines plus extra accuracy and wider range of adjustment. The "Open-Door" accessibility permits quick, thorough cleaning . . . prevents the possibility of previous batches from contaminating new samples.

Investigate Sturtevant equipment for your laboratory. It will cut your sampling costs . . . help maintain strict quality of products . . . increase sales. Write for complete details and catalog.

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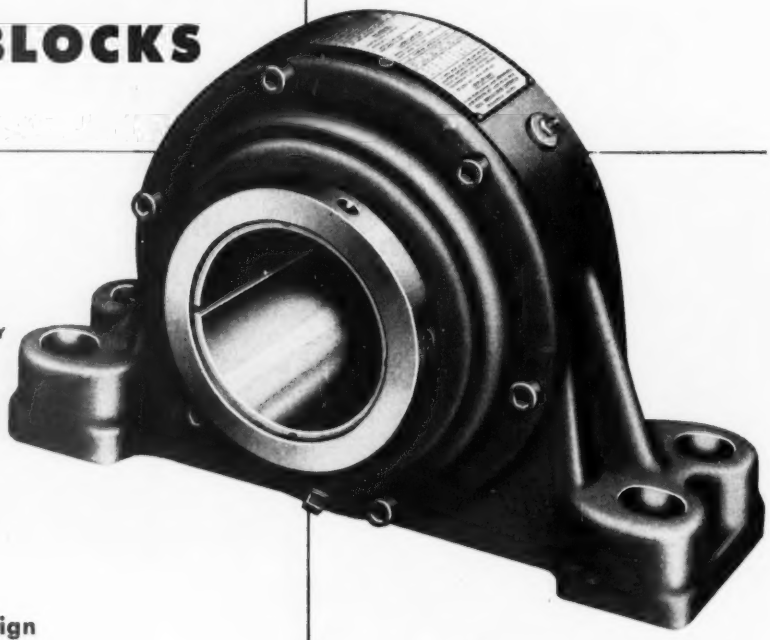
DODGE-TIMKEN ALL-STEEL PILLOW BLOCKS

HEAVY DUTY CAPACITY!

LESS SPACE! LESS WEIGHT!



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- Double piston ring seals
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Here are the bearings for industry's toughest jobs. High radial and thrust capacities. Stamina to take heavy shock loads. And all-steel construction packs this load-carrying capacity into less weight and less space. Engineers are already specifying "Dodge-Timken All-Steel" for some of America's largest projects. Write for details and delivery dates, or call your Dodge Distributor.

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of Mishawaka, Ind.

Even the Ancient Chinese had a Yen for Parking Meters

Time wasn't very valuable in ancient China but hot water was, because fuel had been scarce ever since anybody could remember. So, when a fastidious citizen parked himself in the community tub and called for the Saturday Night Special, one of the boys clocked off the hours on the very quiet-running timepiece above. This simple clock consisted of four copper tubs with water dripping slowly from one tub to the next. In the bottom one, a float, rising with the water, indicated the time—and hot water consumption—on a scale. It wasn't very accurate but five hundred years ago it was considered a marvel of ingenuity. It's much easier to keep accurate tab on operating costs today, and in the drilling business, those costs are always appreciably lower when Truco Diamond Bits are on the job. Their irresistible cutting power takes them through any formation, swiftly, accurately, thriftily, dependably. They are used profitably in every phase of drilling. May we send you our catalog?

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What can be done to stop —

AIR POLLUTION?

The answer is "plenty"! Sure there are problems yet to be solved—and new ones will be created as industry develops and expands. But the fact remains that *dust*, one of the major factors in most air pollution problems, has been and can be controlled effectively.

The American Air Filter Company first tackled industrial air pollution over 20 years ago. Since then, AAF engineers have literally "lived" with industry's many and varied dust problems. Result — ROTO-CLONE—the world's most complete line of dust control equipment.

Today, over 20,000 ROTO-CLONE units are helping industry to forestall court injunctions, citizens committees and irate housewives by removing that major irritant —dust. With dust under control, the other problems of air pollution often disappear or take on less importance.

Start now by appointing your local AAF representative as a "committee of one" to check your present dust sources and recommend effective means of control. Call him, today, or write us direct. Remember—"big air pollution problems from little dust sources grow".

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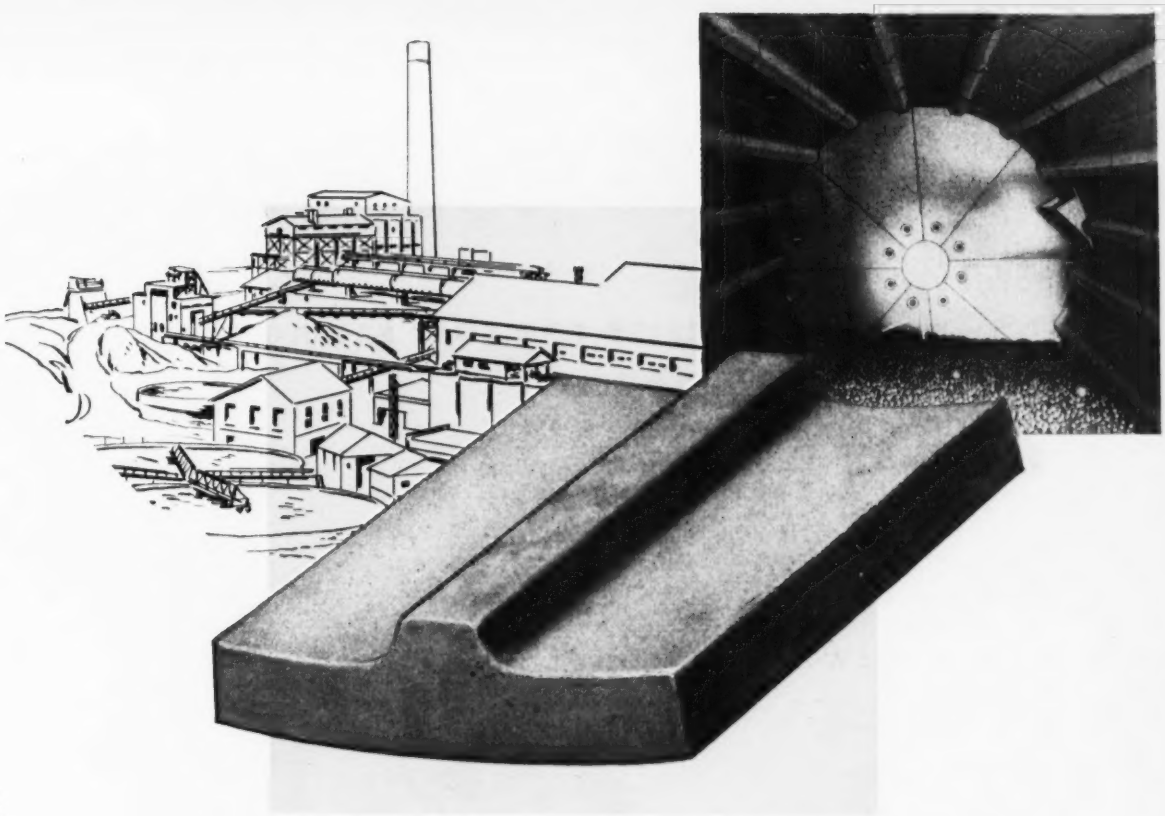

this LINER boosted production 35%

AMSCO Ball Mill Liners

Reduced Down-Time, Increased Production...

A large West Coast cement producer found that Ball Mill Liners were causing expensive trouble. Liners were thick—*over 3 inches.* This meant reduction in mill capacity. Thick liners also meant tremendous weight. Both thickness and weight reduced production and efficiency. *Liners wore rapidly,* too, causing frequent, expensive replacement jobs, with costly labor and material. And added to the bill was lost production due to mill down-time.

Well-known for their skill in handling impact and abrasion-resistant alloys, AMSCO engineers and foundrymen were consulted.

AMSCO solved the Ball Mill Liner problem.

AMSCO designed a new, light, thin—*1 inch thick*—liner, which because of lightness and thinness increased mill capacity, heightened efficiency. The new liners lasted beyond all expectations and in addition the segments were easier to install. These factors, plus reduced replacement down-time, have been responsible for a *35% increase in production.*

AMSCO is the largest producer of Manganese Steel, "the toughest steel known," which has proven itself under countless abrasion and impact situations. And where the service conditions require it, AMSCO also produces Chromium-Molybdenum and Chrome-Manganese alloys.

If you have a tough wear problem and suspect that there may be a better alloy for your purpose, you are invited to write to AMSCO for further information.

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Foundries at Chicago Heights, Ill.; New Castle, Del.; Denver, Colo.; St. Louis, Mo.; Los Angeles, Calif.

Offices in principal cities. In Canada: Joliette Steel Limited, Joliette, Quebec.

heavy media

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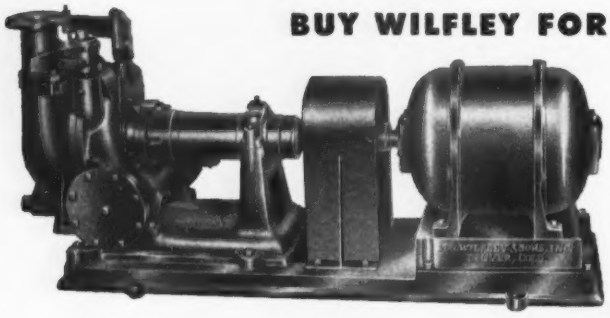
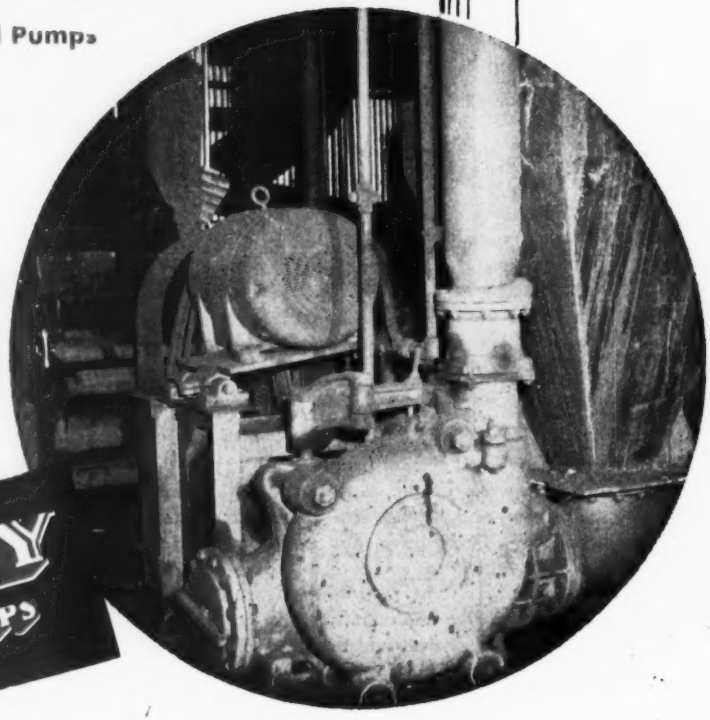


Companion to famous Wilfley Acid Pump



This Wilfley Model K *pump is extremely effective in heavy media circuit and thickener circuit work in coal washing operations. Specifically designed for rugged, heavy duty performance, delivering continuous, trouble-free operation at low cost without media loss, leakage or dilution.*

WILFLEY centrifugal PUMPS

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A. R. Wilfley & Sons, Inc.

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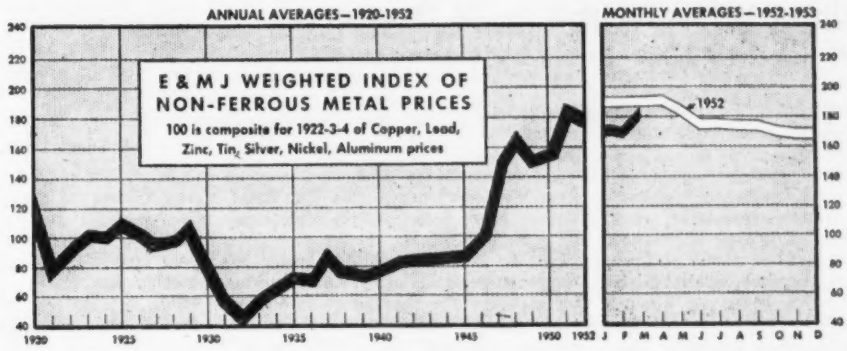
E&MJ OUTLOOK

PRICES


ANNUAL AVERAGES—1920-1952
MONTHLY AVERAGES—1952-1953
E & M J WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is composite for 1922-3-4 of Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum prices
1952
1920 1925 1930 1935 1940 1945 1950 1952
J F M A M J J A S O N D

MARKETS

The latest "peace offensive" is being taken quite seriously in metal market circles, especially in Europe and the U.K. The result is further unsettlement in world prices of basic commodities.

The continued climb of the domestic copper price pulled the E. & M. J. index of non-ferrous metal prices up to 184.44 in March from 172.29 in February. The March domestic average for copper was 29.289c. per lb., f.o.b. refinery, against 24.968c. per lb. in February. If Russia's peace moves are genuine, forthcoming months may see lower averages.

Zinc smelters seem disposed to stockpile metal at 11c., rather than sell. Production of zinc and lead is declining, but actual use has held up remarkably well.

•

LABOR

Labor trouble in Chile and Rhodesia last month had some wondering if any labor unions have an idea that work stoppages will hold the copper market high. Time was when they would, but that time is vanishing.

Mine, Mill's after a premium price plan to finance full operation and higher wages in lead-zinc mines. The union is also backing Sen. Johnson's Metals Bank plan, and demands sale of U.S. metals to Soviet satellites to bolster lead and zinc markets.

Dave McDonald, new president of the CIO Steelworkers union, plans a stepped-up organizing drive against Mine, Mill in nonferrous mining.

•

AT HOME

An inventory recession seems indicated for the last half of 1953. Automobiles, appliances, other products made of metals are piling up in warehouses of fast-producing factories. It means a letdown in production to some extent, at least, later this year.

This need not affect mining, nor the economy in general, adversely, if business and government leaders act wisely. So far, there's no indication that their actions will be anything but just that.

Industry in general plans to spend about 6% more than last year on capital expansion programs, according to McGraw-Hill's latest survey. That will make this year the peak year in the capital goods market.

Chances are that Felix Wormser, St. Joe vice president, will accept the post of assistant secretary of the Interior, if confirmed by the Senate. He'd have full authority over mining affairs in Interior.

•

ABROAD

Uranium, not gold alone, is currently the key to trading interest in South African gold shares. Rand uranium extraction has already yielded dividends and more are expected.

MARKETS—Trends and Prices

Metals Unsettled on Korean Peace Overtures—Copper Raised to 30¢. Basis by Kennecott

THOUGH DIPLOMATS on this side of the Iron Curtain were most reserved in their appraisal of the latest Communist-inspired "peace offensive," operators in sensitive basic commodities the world over responded as if the moves possessed real substance. European and British metal markets suffered a sharp setback, which caused buyers here to hesitate in placing new business as March ended. The political developments probably prevented sellers of both lead and zinc from raising their quotations moderately over the depressed levels of the last month. In copper, consumers became more price conscious and hesitated in taking on forward shipment metal.

Actual consumption of nonferrous metals in the United States throughout the first quarter of 1953 continued to rise. However, purchasing agents reported a tapering off in new business that involved second quarter deliveries. Backlogs are being reduced because of price uncertainties, particularly in finished products where competition is steadily increasing.

The Federal Reserve Board's index of industrial production for March was estimated at 240% of the 1935-39 average, which compares with 239% in February and 221% in March a year ago. Industrial production in the U. S. in the first quarter established a postwar high. Automobile output and production of defense materials accounted for much of the rise

Metals Index Higher

The *E & M J* index of nonferrous metals prices rose from 172.29 in February to 184.44 in March, despite mixed price trends. The rise resulted from an upward adjustment in domestic copper that was in the cards following decontrol of the price. This development outweighed lower averages for lead, zinc, and tin. Aluminum was maintained at 20½¢ per pound on ingot, indicating that producers are in no hurry about disturbing the substantial price advantage they now enjoy over most competitive metals.

Interest centered in domestic copper. Throughout the first three weeks of March consumers were scouring the market for all of the cheaper domestic copper they could get hold of, preferably at the lower level named by Kennecott, to keep their averages down because competition for business in copper products is increasing.

On March 25, Phelps Dodge announced that it raised its selling basis on its domestic mine output from 28½¢ to 30¢ per pound. Early on March 31, Anaconda adjusted its selling basis on domestic copper downward from 32¢ to 30¢. On the same day, Kennecott announced that effective on April 1 its price on domestically produced copper would rise from 27½¢ to 30¢. These moves were interpreted as an attempt to temporarily stabilize the market at this level, even though smaller producers and custom smelters were able to sell their nearby copper at prices ranging from 32¢ to 34½¢, delivered. Despite these adjustments, the market was greatly disturbed as the month ended on rather heavy offerings of foreign copper from sources other than Chile at lower prices, with actual selling pressure in evidence where long-term contracts were involved. Larger supplies were available from Africa, with Rhodesian, Belgian Congo, and South African metal involved in the offerings to consumers. Some of this metal sold during the last month will come here in the form of blister to be refined and sold for U. S. consumption. Canadian producers also were anxious for a greater share of the U. S. market.

Copper Outlook Changing

As the first quarter ended it was apparent that the supply situation in copper was improving rapidly. NPA allocated some 135,000 tons of copper for U. S. consumption in April. This total was the estimated supply available from foreign and domestic sources. Consumption of copper is expected to continue at a high level in April. However, few in the industry believe the fabricators will absorb this large tonnage at any price. In short, a buyer's market apparently is near at hand.

Copper scrap is beginning to move in volume and premium prices enjoyed over the last month or so are softening. A heavy flow of scrap could further unsettle the market by materially adding to the supply.

During March, production of copper in Chile was set back because of a strike at Chuquicamata. The tonnage lost was estimated at around 9,000. Fortunately, this occurred at a time when the demand for Chilean metal at 35½¢ Chilean ports had moderated.

Chilean authorities, now controlling the price of copper in that market, are likely to act soon in adjusting the price to the changing conditions, observers here believe. Our correspondent reports that Chilean officials are following developments here closely and, unofficially, they are far from confident over their ability to maintain the price of copper at a higher level than that prevailing elsewhere. From present indications, U. S. stockpile support is unlikely at a price higher than 30¢.

Lead Sales Improve

Producers of lead were satisfied with the volume of business closed during March. Until the "peace scare" came into the picture late in the month, it was generally thought that the price might rise above the 13½¢, N. Y., basis. Sudden weakness in London injected fresh uncertainty into the market. On f.a.s. Gulf transactions the market was quotable at 11¾¢ per pound. Foreign demand for lead was on the slow side.

Smelters looked upon the 11¢ price for Prime Western zinc as too low; they were in no mood to push for business by making further concessions. Production is falling at high-

Average Prices for March (E&MJ Quotations)

Copper:	
Electrolytic, domestic, refinery	29.289
Electrolytic, export, refinery ..	34.451
Lead:	
Common, New York	13.404
Common, St. Louis	13.204
Silver and Sterling Exchange:	
Silver, New York, per oz.	85.250
Silver, London, pence per oz. ..	74.000
Sterling Exchange, "Checks"	281.605
Zinc:	
Prime Western East St. Louis	11.029
Tin:	
New York Straits	121.442
New York, 99% min. ....(e)	120.442
Gold, per oz. U.S. price	$35.000
Quicksilver, per flask	198.115
Antimony (E&MJ) (d)	37.970
Antimony, bulk, Laredo	34.500
Antimony, in cases, Laredo .	35.000
Platinum, refined, per oz. ..	90.000
Cadmium (a)	200.000
Cadmium (b)	207.500
Cadmium (c)	215.000
Aluminum, 99% plus, ingot .	20.500
Magnesium, ingot	26.423
Nickel (f)	60.000

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.

(a) Cadmium average based on the producers' quotations.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.

(e) Tin content.

(f) F.o.b. Port Colborne, U.S. duty included.

Markets Continued on Page 104

cost mines. Except for an unexpected break in London, the price here might easily have risen. Special High was in good demand, but buyers of the galvanizing grade were more than a little cautious.

Tin weakened in London and Singapore on Korean developments, which finally disturbed the New York market sufficiently to bring out prompt metal at concessions from the RFC's selling basis of $1.21½. As March ended prompt tin was available in the open market at $1.19 per lb.

Tungsten ore was available in the foreign market at $40 per short ton unit of WO_3, c.i.f. N. Y., duty extra.

"Free" Gold Market

Gold volume in all free markets rose about 6% during March. Price movements were narrow and transit rates declined from 1 to 3%. Bombay, after establishing a new high for the year, lost some ground during the last month. Shipments to India have been declining. Pick's World Currency Report quotes as follows, per fine oz.:

	COINS		BARS (12.5 kg.)	
	Feb. 28	Mar. 31	Feb. 28	Mar. 31
NEW YORK, transit	.....	.....	$37.35	$37.20
MANILA	$47.00	$46.50	39.00	38.40
HONG KONG	46.00	46.00	40.30	39.70
BOMBAY	50.25	46.25	49.75	46.25
TANGIER	47.50	47.25	37.30	37.20
BEYROUTH	46.00	45.50	37.40	37.50
PARIS	50.25	50.25	38.40	38.25
BUENOS AIRES	47.00	45.50	39.50	40.00

Note: All prices are computed at the free or black market value of the U. S. dollar in the local markets.

Major Metals

U. S. DAILY AND AVERAGE PRICES

Mar. 1953	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
2	29.500	34.300	121.500	13.500	13.300	11.250
3	30.375	34.750	121.500	13.500	13.300	11.250
4	29.475	34.175	121.500	13.000	12.800	11.250
5	30.100	34.375	121.500	13.000	12.800	11.000
6	29.175	34.575	121.500	13.000	12.800	11.000
7	No Market	33.425	121.500	13.000	12.800	11.000
9	29.200	34.725	121.500	13.000	12.800	11.000
10	28.600	34.675	121.500	13.500	13.300	11.000
11	29.575	34.600	121.500	13.500	13.300	11.000
12	28.850	34.500	121.500	13.500	13.300	11.000
13	29.150	34.475	121.500	13.500	13.300	11.000
14	No Market	33.975	121.500	13.500	13.300	11.000
16	28.700	34.225	121.500	13.500	13.300	11.000
17	28.350	34.725	121.500	13.500	13.300	11.000
18	29.150	34.275	121.500	13.500	13.300	11.000
19	29.525	34.300	121.500	13.500	13.300	11.000
20	29.800	34.450	121.500	13.500	13.300	11.000
21	No Market	34.600	121.500	13.500	13.300	11.000
23	30.100	34.600	121.500	13.500	13.300	11.000
24	28.575	34.575	121.500	13.500	13.300	11.000
25	29.100	34.775	121.500	13.500	13.300	11.000
26	29.300	34.450	121.500	13.500	13.300	11.000
27	29.200	34.925	121.500	13.500	13.300	11.000
28	No Market	34.700	121.500	13.500	13.300	11.000
30	30.100	34.200	121.250	13.500	13.300	11.000
31	28.450	34.375	120.250	13.500	13.300	11.000
AVERAGES FOR MONTH						
Mar.	29.289	34.451	121.442	13.404	13.204	11.029
AVERAGES FOR WEEK						
Mar.						
4	29.590	34.183	121.500	13.417	13.217	11.250
11	29.330	34.396	121.500	13.167	12.967	11.000
18	28.840	34.363	121.500	13.500	13.300	11.000
25	29.420	34.550	121.500	13.500	13.300	11.000
CALENDAR WEEK AVERAGES						
Mar.						
7	29.725	34.267	121.500	13.167	12.967	11.125
14	29.075	34.492	121.500	13.417	13.217	11.000
21	29.105	34.429	121.500	13.500	13.300	11.000
28	29.255	34.671	121.500	13.500	13.300	11.000

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Mar. 1953	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold London	Gold (d) United States
2	281.8750	85.250	74.000d.	248s.	$35.00
3	281.7500	85.250	74.000d.	248s.	35.00
4	281.5000	85.250	74.000d.	248s.	35.00
5	281.6250	85.250	74.000d.	248s.	35.00
6	281.6250	85.250	74.000d.	248s.	35.00
7	(e)	(e)	(e)	(e)	35.00
9	281.6250	85.250	74.000d.	248s.	35.00
10	281.6250	85.250	74.000d.	248s.	35.00
11	281.6250	85.250	74.000d.	248s.	35.00
12	281.5625	85.250	74.000d.	248s.	35.00
13	281.3750	85.250	74.000d.	248s.	35.00
14	(e)	(e)	(e)	(e)	35.00
16	281.5625	85.250	74.000d.	248s	35.00
17	281.7500	85.250	74.000d.	248s.	35.00
18	281.5625	85.250	74.000d.	248s.	35.00
19	281.6250	85.250	74.000d.	248s.	35.00
20	281.6250	85.250	74.000d.	248s.	35.00
21	(e)	(e)	(e)	(e)	35.00
23	281.6250	85.250	74.000d.	248s.	35.00
24	281.6250	85.250	74.000d.	248s.	35.00
25	281.6250	85.250	74.000d.	248s.	35.00
26	281.6250	85.250	74.000d.	248s.	35.00
27	281.5000	85.250	74.000d.	248s.	35.00
28	(e)	(e)	(e)	(e)	35.00
30	281.5000	85.250	74.000d.	248s.	35.00
31	281.5000	85.250	74.000d.	248s.	35.00
AVERAGES FOR MONTH					
Mar.	281.685	85.250	74.000d.	.....	35.00
AVERAGES FOR WEEK					
Mar.					
4	281.775	85.250	—	—	—
11	281.625	85.250	—	—	—
18	281.563	85.250	—	—	—
25	281.625	85.250	—	—	—

Calendar Week Averages, New York Silver: March 7th, 85.250; 14th, 85.250; 21st, 85.250; 28th, 85.250.

(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotations for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered, in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at .99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen

According to one school of thought, going to Butte and not taking in the Rocky Mountain down in Meaderville, is like chewing on the glass after you have thrown away the martini. The Rocky Mountain, for the information of those unfamiliar with Butte and environs, is an institution which provides the local citizenry and transients with entertainment, excellent steaks, and diverse cultural pursuits. If you have missed it, the situation, fortunately, is not as dire as it might seem. Working on the theory that as Butte goes, so goes the Rocky Mountain, the establishment will be around for a goodly number of years to come. This prediction is based on the facts in John Huttl's article on the Greater Butte Project, page 77. Production is already nearing the 10,000 tons-a-day neighborhood and new reserves should lengthen the life of Butte by several decades. (By the way—keep your eye peeled as you get toward the end of this article, for some valuable information on the use of electrostatic dust precipitators underground.)

Lead-zinc mining is coming out in the open. First the Barvue up in Quebec and now the Van Stone mine on page 72, which is a pretty handy location for a mine. The story on AS&R's new Washington producer not only gives you the facts on the open pit operations but demonstrates some heads up mill design in the 1,000-ton concentrator.

For a change of pace, in fact a complete reversal of direction, K. L. McRorie, Chief Engineer, tells how Steep Rock Iron Mines is switching from open pit to underground operation on its Errington orebody. Steep Rock is also stripping its Hogarth orebody for production and the two mines are expected to yield 3½-million tons of ore a year. You'll be able to find the details on pages 82 to 85.

P. S. There's a "caboose" on this article which tells about Inland Steels' plans at Steep Rock Lake.

Take a look at a floating Heavy Media plant on the beautiful Ohio which is not only providing low-cost, high-quality gravel for nearby concrete mixers, but will offer valuable data on a process for producing sound aggregate from poorer deposits. Development, design and operation of the floating plant make two more pages of interesting reading, these being pages 86 and 87.

One thing that interested us particularly was the reference to the Los Angeles rattler test. Was a time in the days of the iron horse when the Los Angeles rattler meant a test of human endurance over soot, cinders, heat and square pullman wheels. That was a time when a man was a man if he passed the rattler test. Now apparently, he's just a load of gravel.

Every once in a while something happens that restores our faith in the tenet that, despite newspaper headlines, people are nicer than anybody. Such is the case of a fan letter written by 22-year old Billy Walker of Greene, Iowa, paralyzed from birth.

Billy wrote a fan letter to radio station WOWO of Fort Wayne, pounding out the words on a battered typewriter, to say he liked their programs. In a postscript, he apologized for the typing, blaming it on his own physical trouble and the typewriter. The station broadcast the text of Billy's letter with the postscript and asked each listener to send one cent to help buy a new typewriter for the young man who had never enjoyed normal boyhood games and had built his world around his wheel chair and typewriter.

An avalanche of coins, 78,000 pennies from almost every state in the union and as far away as Bermuda and Canada, was more than enough for the typewriter. When Billy suggested that he would like an electric machine, Remington Rand donated a new electric typewriter.

Station WOWO arranged with station KXEL at Waterloo, Iowa, near Billy's home, to use the 78,000 pennies to advertise Billy's business which is selling magazine subscriptions. Joseph Dumond, KXEL manager, agreed to match the time with an equal amount donated by the station and Billy Walker's business has begun to boom.

What we prayerfully trust will be the last word on the subject was sent in anonymously from Washington this month. It's yours verbatim.

"Anent your remarks re columbium vs. niobium, they have evoked the poet (?) in me to the extent that the following lines poured forth after reading your comments in the March issue of the E&MJ.

The Americans say columbium,
In England it is called niobium
As is the metal aluminium,
Whereas in the States it's aluminum.

Let us at once call a symposium
And all vote for the name columbium
We have won our point on aluminum
So bury the bloke who says niobium!

(signed) *Anonymous*

P. S. You can do what you wish with this and I shudder, too!"

If you would like a framed copy of this epic, just tear the top off a stack of ten dollar bills and mail it in together with your name and address.

It seems like all our sins—well, almost all—are catching up with us this month. Back in November we commented on a mysterious situation that had developed in Teheran, naively asking for an informative word on an outfit operating out of 26 Sevom Esfand St. We got the word all right, but it wasn't about 26 Sevom Esfand St. One gentleman wrote indicating that we implied that the entire Teheran mining industry was conducted in one barbershop and that such a note would "only (bring) harm to our country and to the firms . . . working in the mining business long years."

Such was not our intention, and for the record Iran has a young but vigorous mineral industry with many progressive enterprises. We have the word of our correspondent that none of these operates in a barber shop.

ENGINEERING AND MINING JOURNAL

APRIL, 1953

The Party's About Over

SLOWLY AND SURELY, like the jungle growing back over an abandoned camp-site, the forces of supply and demand will still, if permitted, work together to wipe out even the severest market imbalance.

Copper furnishes to the student of market behavior, an excellent demonstration of this fact. Thrown wildly off balance over the last years by various governmental activities, the market is at last righting itself. Briefly, the situation is this:

For months, the U. S. has been the strongest market for copper in the free world, and the only market for copper priced as high as Chile's 36½¢ metal. Now, with domestic controls off, scrap is again flowing freely, and larger tonnages of foreign copper are entering the U. S. to catch the market while it is still high.

Rhodesian copper has been sold here instead of in its usual British markets, and for the first time in many years, Belgian Congo copper will be sold in the U. S.

The weighted average for sales of domestic copper was running at around 30¢ per lb. as March ended. Foreign copper was still sold at prices as high as 36½¢, Valley, but almost no one was willing to buy copper for July delivery, even at prices as low as 32¢ per lb. At present, there is probably more copper being offered here than is being consumed.

There is no dodging the fact that the party is over for those whose bills have been paid by high-priced copper. This is not to say that a collapse is imminent. Far from it. Probably, the several domestic and foreign prices for copper will stabilize and merge over the next few weeks, perhaps coming to rest in the neighborhood of 27¢ or 28¢. Copper held at a higher level will simply be left dry as well as high.

To some extent this same situation prevails in other metals. We hope sincerely that raw material producing countries outside the U. S. will recognize that fact and will avoid any rash action in an attempt to prolong an unnatural market condition that is now vanishing.

We hope, too, that our own government, showing as it is the beginnings of a firm, constructive foreign policy, will take the lead in helping in this readjustment, not by subsidies and grants-in-aid, but by sound guidance, by genuine assistance to private investment abroad, and by strong leadership in working out reasonable solutions to the world's knotty problems of restricted trade and failing currencies.

If these steps are taken, the after-party headaches can be minimized, but if the partygoers refuse to go home, in short, if expedients are sought instead of real solutions, the consequences, for a few raw material producing countries at least, could be disastrous.

That Mine, Mill Movie

NATION-WIDE INTEREST, including a large measure of indignation, flared up in recent weeks over a movie, "Salt of the Earth," being sponsored by the Mine, Mill and Smelter Workers Union, and produced by a group of leftist "independent" Hollywoodians.

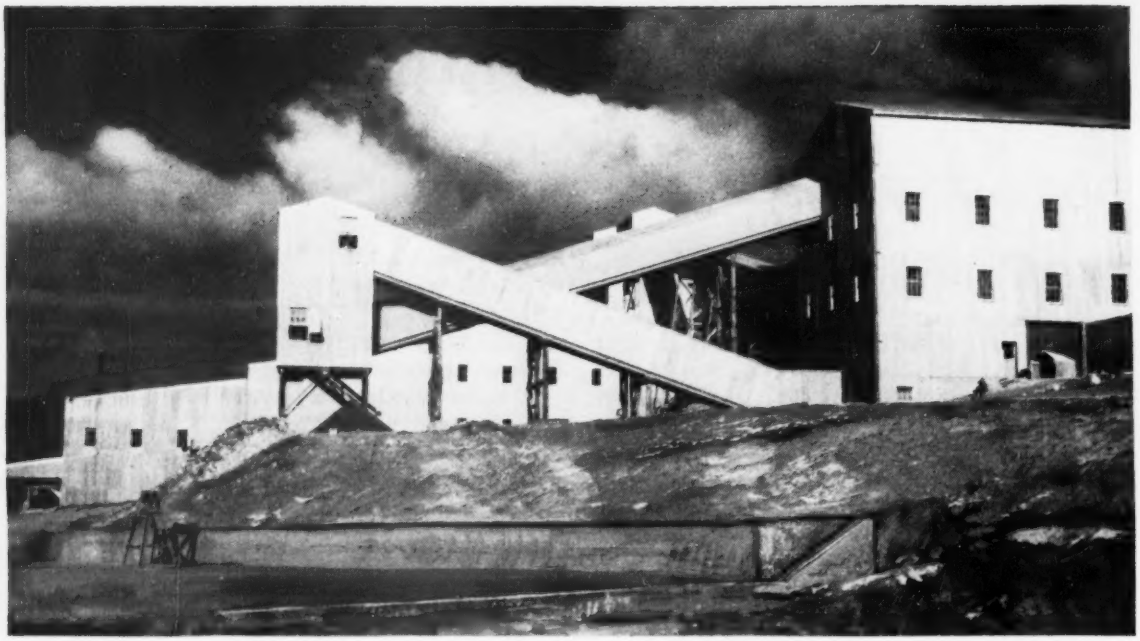
With much of the footage being shot in and around Silver City, N. M., the movie is obviously based on the long strike of the union against Empire Zinc Division of New Jersey Zinc Co., which ended about a year ago. In fact, the union's leaders have proclaimed this specific background of the movie in the loudest and most insulting terms.

There is a reason for that. The Mine, Mill leaders *want* people to be angry about this movie. They *wanted* people to form vigilante committees to try to stop the camera crews. They *want* the movie to be picketed, condemned and fought over when and if it is ever shown.

Nothing suits an American communist more than martyrdom, a chance to wrap himself in the American flag and shout, "Go ahead, hit me!"

Let's not do Mine, Mill's leaders this favor. The movie, with its dubious sponsorship, has almost no chance of wide circulation, if left to itself. It *does* have a chance at wide-spread attention if violence and force are used to try to stop it.

Management's most effective weapon against the subtle and vicious propaganda Mine, Mill's leaders know so well how to use is still a decent, fair approach to labor at all times. Meanwhile, let Mine, Mill's leaders consider this: The people of the United States are patient and slow to anger, but they are not stupid and they do not permit disloyalty to go unpunished.



MODERN DESIGN, including latest ideas on economy of effort in operation and control, characterize this new 1,000-ton lead-zinc mill of American Smelting & Refining Co. at its Van Stone mine, Northwest's newest producer.

A. S. & R.'s Van Stone Mine

JOHN B. HUTTL
Associate Editor

IN ADDITION TO ITS IMPORTANCE as a new producer of lead and zinc, the Van Stone mine, being developed by American Smelting & Refining Co., supplies an excellent example of the advanced mill design for which A.S.&R.'s milling staff, headed by Norman Weiss, milling engineer, is steadily getting to be better known.

The 1,000-ton concentrator at the Van Stone, now in the breaking-in stage, includes the most useful elements of modern control and safety ideas available. These are brought out in the following discussion of the mine and the mill, and in the photographs and flowsheet.

Van Stone's Discovery

In 1920 George Van Stone and his partner, Harry Maylor, pros-

DRILLING in the relatively small pit is by wagon drill, using 1¼-in. alloy steel with 2½-in. carbide bits. Holes are drilled on 6-ft. centers, benches are 18 ft. high.

MINING at Van Stone is by contract with Isbell Construction Co. Here a 2½-yd. Northwest loads a 10-yd. Euclid for haul to crushing plant ¾ mi. away.

pected up the middle east fork of Onion Creek in northern Stevens County, Wash., to investigate rumors of lead-zinc discoveries. During their wanderings, they found rich lead float, and while looking around for the source, they saw a spot where several trees had been destroyed by lightning. Reasoning that minerals close to the surface might have attracted the lightning bolts, the men investigated and actually found lead-zinc outcroppings. This was the beginning of the Van Stone mine.

Hecla Takes Option Early

From the date of discovery until Hecla Mining Co. took an option on it in 1926, the property was worked periodically by the owners and several leasers. All efforts were frustrated, however, by the penalties imposed by the smelters because of high zinc content.

Hecla Mining Co. held the option for about two years, and carried out considerable exploration and development work. Upon relinquishment of the option, the original owner again took over, and in addition to other exploratory work, sank a 65-ft. winze from the 200-ft. upper tunnel mentioned, leading to the discovery of high-grade lead ore.

Low metal prices during the depression rendered these operations unprofitable and the mine remained idle until 1939 when Willow Creek Mines Co. acquired it under a lease and option agreement.

The company did extensive diamond drilling from 1940 to 1942 (69 holes) during which the north orebody currently under exploitation was discovered.

American Smelting took over the property from Willow Creek Mines in 1950, carrying on a comprehensive diamond drilling campaign through the greater part of 1951. The work developed sufficient ore to warrant construction of a 1,000-ton flotation concentrator.

Actual mill construction was started in Sept., 1951, and stripping of overburden covering the north orebody commenced in October of the same year. The first shipment of lead and zinc concentrates was made on Nov. 13, 1952.

Location

The property is situated in Stevens County, Wash., about 105 mi. north of Spokane and 25 north and slightly east of Colville, the county seat. It can be reached by automobile from Highway 22, a few miles north of Bossburg, a station on the Great Northern R. R. branchline running from Spokane to Nelson, B. C. The terminus of a short rail spur paralleling the road for a short distance and serving a nearby quarry is the nearest shipping point. Haulage distance from the mine is approximately 10 mi.

Geology

The geology of the area and type of ore found at and near the Van Stone mine resemble those in the Metaline district in the neighboring Pend Oreille County. The ore deposits are found in Middle Cambrian Metaline formation dolomites in intrusive contact with granodiorite of the Kaniksu batholith. Contact is about 1,500 ft. north and west of the mine.

The Metaline formation occurs on the north limb of a large faulted and contorted anticline whose axis runs roughly N 50 deg. E. Lower Cambrian formations are exposed in the heart of the anticline southeast of the Van Stone mine, and near it they are in fault contact with the Metaline formation. In the area of the mine itself, the ore is found to occur as bedding replacement deposits within the Metaline dolomite.

The chief sulphides, sphalerite, pyrite, pyrrhotite, and galena, occur in detail as replacements along bedding planes or as relatively high-grade pods elongated parallel to the bedding. Jasper, common in Metaline district mines, occurs at the Van Stone, and tremolite, a hydrous magnesium silicate, is the only contact metamorphic mineral developed.

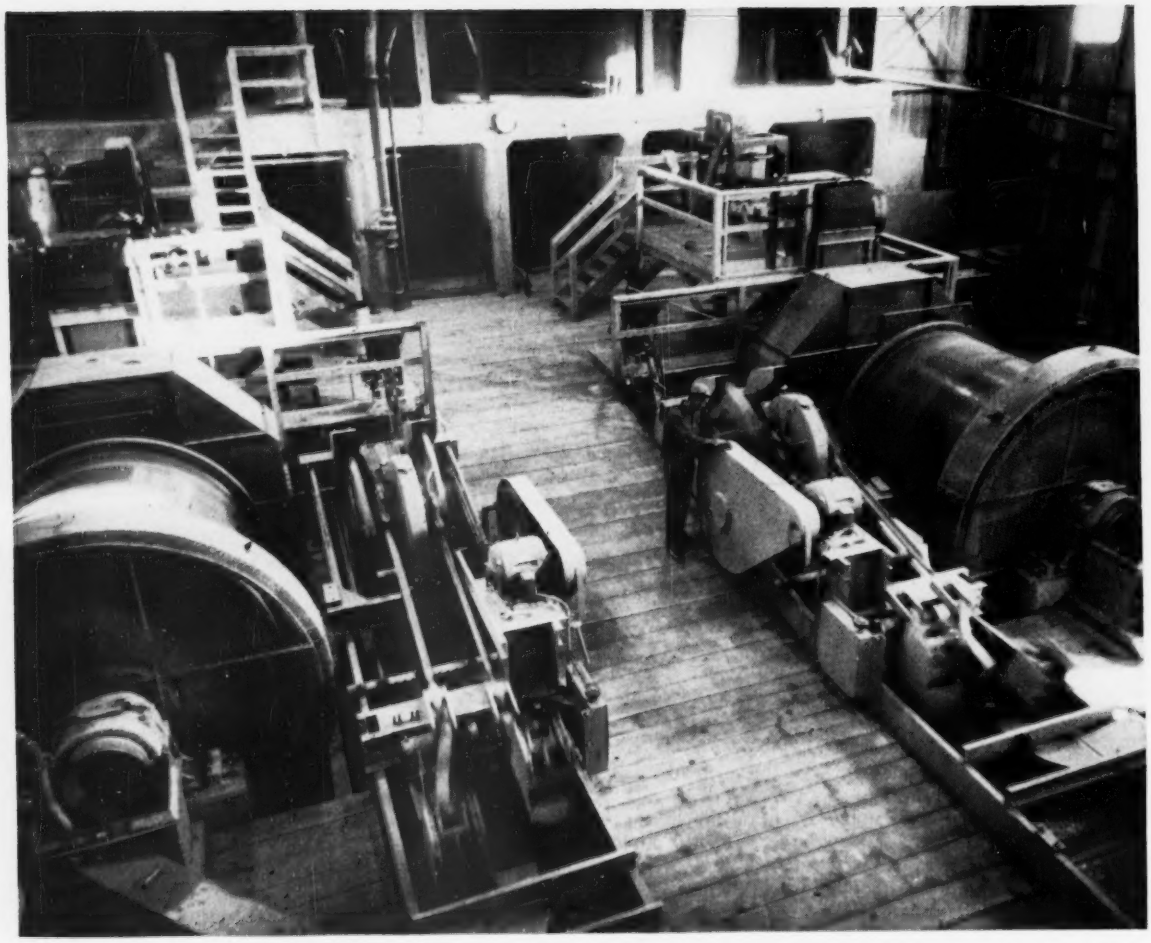
Pit Operations

The north orebody currently under exploitation is mined by typical open pit methods. All work at the pit is done by Isbell Construction Co. under the direction and supervision of American Smelting's engineering staff. The upper part of the pit early in Dec., 1952, was about 1,400 ft. long and 400 ft. wide, with the first bench at an elevation of 3,800 ft. above sea level.

Ore is mined in benches 17 to 18 ft. high, and permanent beams are left every 50 ft. Blast holes are drilled on 6-ft. centers with G-D wagon drills using 1¼-in. round, hollow alloy steel fitted with detachable tungsten-carbide Timken bits. Starters measure 2½ in. and finishers 2¼ in.

Number of holes per blast varies from 75 to 150, depending on the width of the ore on a particular bench. The holes are loaded with 2x12-in. cartridges of 60% gelatin dynamite and detonated with millisecond blasting caps.

Broken ore is loaded into 10 yd.



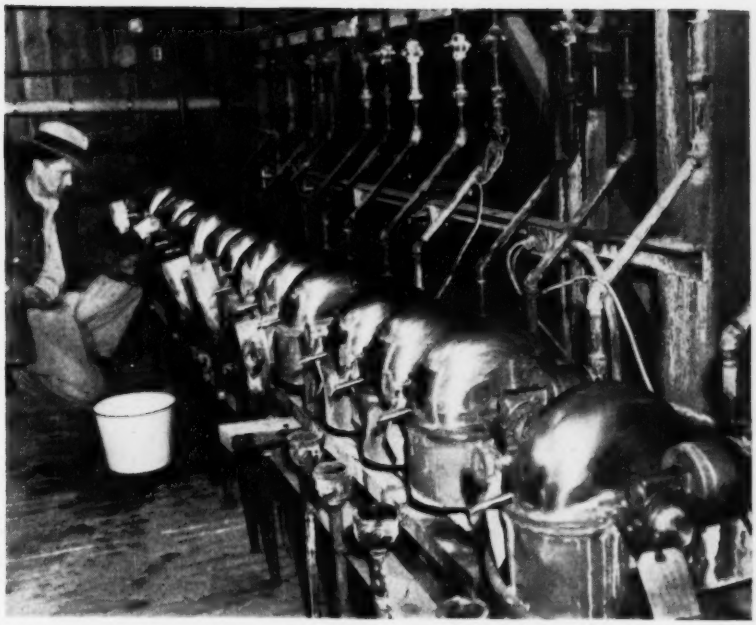
UNCLUTTERED LAYOUT makes operation easier. Roland Schrader checks classifier operation. Note ball bins.

CONVEYOR SCALE keeps record of ball mill feed, noted by Art Bolt. Note scale's open position.

Euclid end-dump trucks by a 2½-yd. Northwest 80-B diesel shovel. Haulage roads are laid out on 3½% grades in favor of loaded trucks. Distance between pit and crushing plant is about ¾ mi.

For cleanup work and emergency loading a ¾-yd. Northwest diesel shovel is available. Auxiliary pit equipment includes a D-7 and a D-8 Caterpillar bulldozer, motor patrol grader, service and grease trucks, and snow plow.

Most of the stripping is done during summer and early fall. To insure continuous mill operations during the winter when heavy snows may hamper pit work, a large stockpile of ore is always maintained at the head of the crushing plant. Pit work is conducted on one shift, with current production averaging 1,500 tons waste and 1,000 tons ore a day, indicating a waste-ore ratio of 1.3:1. Owing to one-shovel operation, dictated by the relatively small size of the pit, grade control is somewhat difficult. It has been



CENTRALIZED REAGENT CONTROL also aids operation. Ken MacCallum, assistant mill superintendent, checks on flow.

SHOVEL LOADING is typical materials handling method in mill. Bob Blake, superintendent, tries his hand at it.

possible to maintain a mill feed assaying from 3½ to 4% combined lead and zinc by selective shoveling, whenever this can be done economically.

Milling Operations

The new 1,000-ton flotation concentrator consists of a crusher building and mill building proper about ¾ mi. by road below the pit. Both are wood-and-steel frame structures sheeted with galvanized iron. Design, layout of equipment in interiors, and construction was done by Western Knapp Engineering Co., a division of Western Machinery Co.

At the time of *E&MJ's* visit early in Dec., 1952, milling operations were still in the "breaking in" and test stage, about 750 tons of ore being handled a day. Full tonnage of 1,000 tons plus awaited lifting of power and water shortage.

The different operating floors are accessible by truck to facilitate unloading of equipment and materials, and, to aid the service crane, the ball mill and flotation areas are clear of overhead conduits and water lines. Grinding balls are dumped direct by truck into storage on the level containing feed conveyors to ball mills, obviating lifting the balls to charge the mills.

Controls and pushbutton installations are placed at strategic points in the mill so that they are easily accessible and in clear view of the equipment they control. In addition, there are start and stop controls at each individual motor. All electrical switches are mounted on centralized panels.

The reagent mixing platform is on the pump floor, permitting direct unloading of trucks, and overflow from all reagent feeders flows by gravity to the mixing tank to be reclaimed.

The mill service floor is a concrete slab at ground level, with slopes for drainage to different sumps. On this floor are the pumps, thickeners, filters, and auxiliaries. The underside of these units is easy of access, simplifying and speeding clean-up and repair.

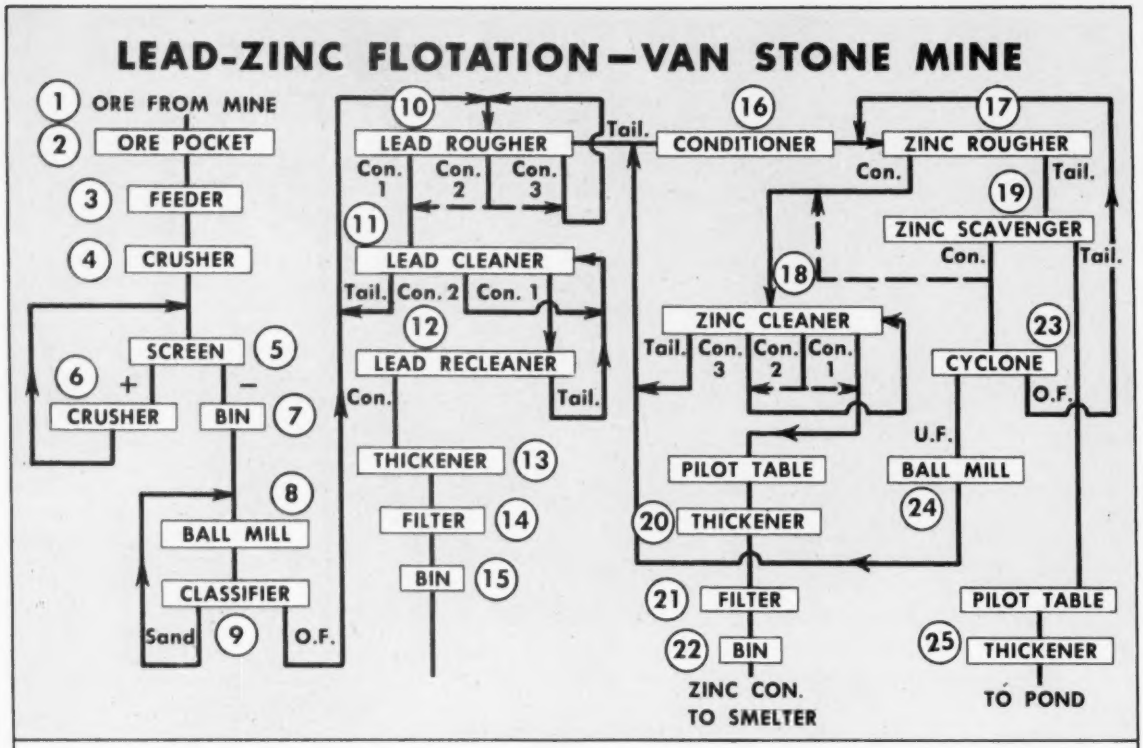
Feed Control Is Automatic

Automatic feed control installations at the crushing plant are interesting and effective. Here also all motors are interlocked. In the event the pressure lubrication on the primary jaw crusher fails, a horn will blow and the feeder shut off. Similarly, the feeder ahead of the secondary cone crusher will be shut off if the oil pressure is not restored to normal within 30 seconds. If the speed of the conveyor operating between the primary and secondary crushing circuits slows to 70% below normal, the feeder is shut off, allowing the plant to clear.

The ore is crushed and ground as shown in the flowsheet. During the current breaking-in period the ore is ground to 67% minus 200-mesh. Lead and zinc recovery follows standard practice.

Finished lead and zinc concentrates are trucked to the rail point mentioned previously by Anthony Cinder Body trucks with extended conveyor.

A regrind unit for handling zinc middlings consisting of a 4-ft. ball mill and a DorrClone is in process



LEGEND

1. Ore hauled in 10-yd. Euclid end-dump trucks.
2. Ore pocket with 24-in. grizzly.
3. Telsmith 48-in. apron feeder, followed by 4x8-ft. bar grizzly, 3½-in. spacing.
4. Traylor 36x42-in. jaw crusher, 3-in. discharge.
5. Two 30-in. conveyors in series leading to 5x11-ft. Allis-Chalmers screen ½-in. rods.
6. Symons 5½-ft. cone.
7. One 24-in. conveyor to two 800-ton fine-ore bins, over Geary-Jennings samplers.
8. Two 20-in. belt feeders over F.M. conveyor scales to Two Marcy 77 ball mills, 250-hp. synchronous motors.
9. Two 5x25½-ft. Dorr rake classifiers, overflow at 67% minus 200 mesh.
10. Hydroseal and Wemco sand pumps to ten 48-in. Agitair lead rougher cells.
11. Four No. 18 Denver cells.
12. Two No. 15 Denver cells.
13. Dorr thickener, 18x8-ft., Dorr diaphragm pump.
14. Bucket elevator to two-disk 6-ft. Eimco filter.
15. Lead concentrate storage, served by Hough Payloader. Concentrate shipped to E. Helena smelter.
16. Two 8x8-ft. Wemco zinc conditioners.
17. Six No. 66 Fagergren zinc rougher cells.
18. Six No. 24 Denver zinc cleaners.
19. Six No. 66 Fagergren zinc scavengers.
20. Dorr thickener, 30x10-ft.
21. Bucket elevator to five-disk, 6-ft. Eimco filter.
22. Zinc concentrate storage, served by Hough Payloader. Concentrate shipped to Anaconda, Mont.
23. Froth pump to a Dorrclone.
24. Regrind mill, 4-ft. diam.
25. Dorr dewatering thickener, 90-ft. diam.

of installation. It is expected that this regrind operation will raise the grade of zinc concentrates by about 2%. Final tailings from the zinc circuit are dewatered in a 90-ft. thickener, with about 60% of water being reclaimed.

Reagents used currently are of conventional type. Points of addition are as follows: In the lead circuit, Dowfroth, sodium cyanide, and Z-11 xanthate are added to the classifier overflow, and soluble starch to the cleaner. The zinc conditioners receive copper sulphate and Z-11 xanthate, and the cleaner section, lime.

Lead concentrates produced from current test operations assay 60% lead; 8% in zinc; and 1% in iron.

The zinc concentrates run 54% zinc; 5.5% iron; 0.3% lead; and 4% insol. Ratio of concentration on the lead is 130:1 and on the zinc 18:1. Lead concentrates are shipped to the company's lead smelter at East Helena, Mont., and zinc concentrates to Anaconda, Mont.

Buildings Prefabricated

Other surface plant buildings near the concentrator include a general office; repair shop and warehouse, both pre-fabricated Braden structures; assay office; 30-man change room; 8-car garage; and 60,000-lb. Howe truck scale. Two modern 3-bedroom and two 2-bedroom houses are available for the key members of the mill operating staff. Electric power for the mill and camp is furnished by the Washington Water Power Co. over a 33,000-v. line.

Principal members of the operating personnel include P. A. Lewis, superintendent; R. A. Blake, mill superintendent; R. K. McCallum, assistant mill superintendent; Lyle Hallberg, metallurgist; Ralph Stuve, engineer; George Moad, chief clerk; Frank Paparich, pit foreman; and A. T. Knight, master mechanic. Jerry Newton is job superintendent for Isbell Construction Co.

FIRST ORE FROM Anaconda's Greater Butte Project was hoisted through the Kelley Shaft (right) on April 26, 1952. Nearly 3-billion lb. of copper reserves in this venture will prolong Butte's mining life by many decades.

Greater Butte Mine Output Nears 10,000-Ton Mark

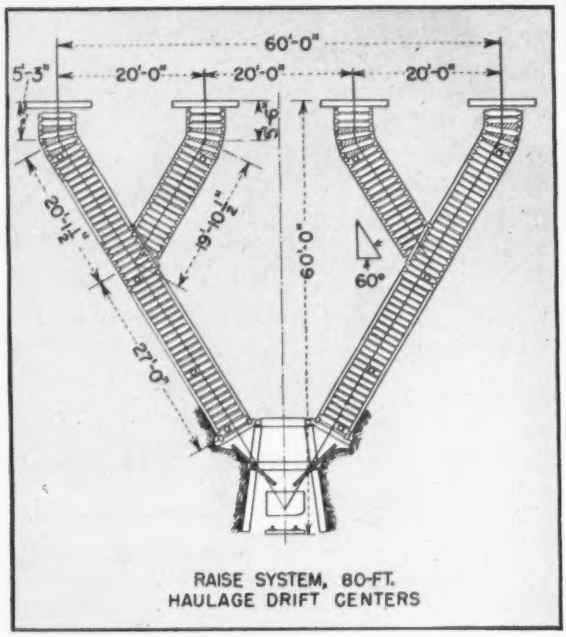
J. B. HUTTL
Associate Editor

ANACONDA COPPER MINING CO.'S Greater Butte Project yielded its first ore through the Kelley shaft on April 26, 1952, and thereby provided industry's answer to charges that America is rapidly becoming a have-not nation in mineral resources, and that the end of some of the famous western mining districts is in sight. Conceived and brought into being by private capital, this new project demonstrates that a huge tonnage of low-grade material, once considered waste, can be converted into ore through technological advances applied and directed by capable management and engineering staffs. As a result, nearly 3-billion lb. of copper reserves have been added to the resources available to industry, and the life of the Butte district will be extended by many decades. Greater Butte production will augment current output from the Butte district, and when in full production, Project ore will more than double the tonnage going through the reduction works at Anaconda.

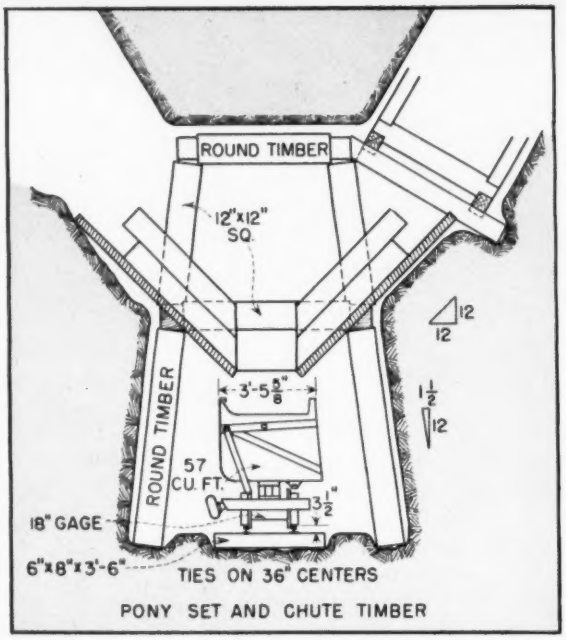
Preliminary development and construction work were described in *E&MJ*, October, 1951. Unique problems involved in the mining and milling of this low-grade ore have attracted world-wide attention and interest. Thus *E&MJ's* visit to Butte district in November, 1952 was planned to obtain answers to these recurring questions: "How are things going at the Greater Butte Project?" and "How do current operations check with preliminary estimates and plans?"

The answer to the second question is that grade, tonnage, mining, hoisting and concentration of the ore are checking previously accepted estimates and tests very satisfactorily. The relatively smooth and successful development of the Greater Butte Project can be attributed to a large extent to the accurate geological data accumulated during the past 50 years of mining in Butte. These data made it possible to determine the existence of low-grade orebodies in the central and eastern section of the district in the area extending eastward about 4,000 ft. from the Anaconda shaft with a considerable degree of certainty without extensive new development and sampling. It also made possible tonnage estimates requiring only minor adjustments after completion of a subsequent sampling and development campaign. Knowledge of location of the principal geological structures such as faults and veins facilitated selection of safe sites for shafts, haulage laterals, and development openings.

Some 130-million tons of low-grade ore containing 20 lb. plus of



TIMBERED RAISES like these drop the caved ore from the grizzly to the haulage level 60-ft. below.



TWIN CHUTES at the bottom of the raise load 57-cu. ft. Granby-type side-dump cars on the haulage level.

copper per ton were definitely outlined in several zones by the geologic study and preliminary sampling and exploration work. This determination was made only to the 3,400 level, though the mines are 4,400 ft. deep and it is known that the low-grade orebodies extend downward below the 3,400 level. The tonnage figure has proved conservative for since start of actual development for mining it has been found that the boundaries of the ore zones outlined may be extended somewhat at different points and levels.

The Greater Butte orebodies are not of the porphyry copper type found in the Southwest. In general, they are regular shaped steel dipping zones which extend to great depth as compared to the flat-dipping, shallow, disseminated deposits mined at Inspiration, Miami, Ray, Ruth, and other points. Copper occurs in a multitude of small veins and veinlets, and as impregnations in the altered country rock. The low-grade areas within the boundaries of the Greater Butte Project lie between zones of high grade which have been mined for more than 50 years by square-set stoping and filling the opening with material too low in copper to be treated at that time. In recent years many sections were filled with wet mill tailings under hydrostatic pressure to minimize fire hazard, stabilize ground future, cool working places, and improve overall working conditions.

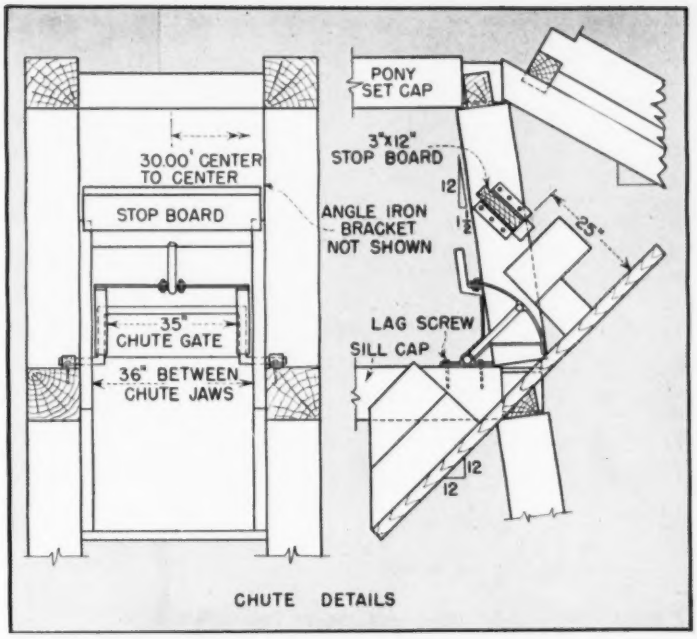
Tailings to Be "Re-Mined"

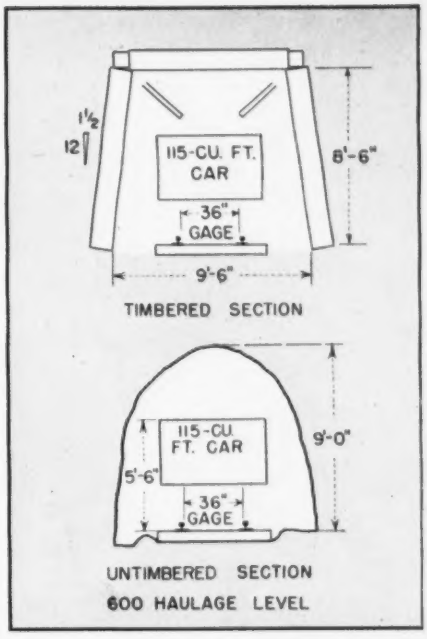
The two large tailings treatment and pumping plants available for fill work are at the St. Lawrence and Tramway mines. Here, fill material received from Anaconda, 25 mi. distant, in 50-ton cars is mixed to proper consistency and pumped at rates from 3,000 to 6,000 tons a day through 8-in. pipes to the shafts and thence through 6-in. and 4-in. pipes to the underground opening to be filled. Paradoxically, this fill material was formerly sent to Anaconda as part of the ore stream and is now being returned to the mines whence it came, only to go back eventually to Anaconda as part of the Project ore. Some 3,200,000 tons have been placed to date, and to give an idea of the magnitude of the operations the following totals of underground work done and equipment installed may be of interest: Reopening of old workings, 103,700 ft.; crosscutting, 26,600 ft.; raising, 2,900 ft.; 6-in. pipe, 23,000 ft.; and 4-in. pipe, 140,770 ft.

The 130-million tons plus ore blocked out in the Project area is available in 12 blockcaving zones. Three major production levels with loop haulage systems have been laid out on the 600, 1,300, and 2,000 levels, whence horizons more than 67-million tons of ore is to be mined.

The principal vertical opening serving the Project is the Kelley shaft now open to full size to 2,175 ft. More than half of this distance is lined with monolithic concrete requiring about 8 cu. yd. concrete and 800 lb. of structural steel per linear foot of shaft, with concreting operations rapidly progressing toward the 1,300 level while hoisting production from the 600 level ore zones. With a crew of nine men on a shaft about 25 ft. of concrete lining is placed a week.

The shaft contains two hoisting compartments measuring 6½x6½ ft.; a manway 6½x6½ ft.; and a compartment measuring 13 ft. 8 in. x 6½ ft. containing the large-double-deck cage will be divided into two hoisting compartments by placing steel dividers into the steel supports embedded in the concrete as soon as daily ore output exceeds 10,000 tons. Dimensions given are inside the concrete. Raise work is now in progress on the 600 and 1,300 levels a short distance south of the Kelley shaft to establish a service shaft. It will be 21½x10 ft. in cross-section, concrete-lined, and contain a large compartment for a double-deck capable of accommodating 100 men and rolling stock 12½ ft. long and 5 ft. wide; a small counterweight compartment, and a ladder way.





DRAWINGS OF CHUTE GATES, and other development structures shown on these pages are supplied to supervisors of installations.

TIMBERED AND UNTIMBERED sections are used in various parts of the 600 level.

The steel headframe over the Kelley shaft is 178 ft. high and carries four 12-ft. sheave wheels. Included in the headframe installation are 12-ton bottom-dump skips with rubber-tired guide rollers, circular ore and waste bins, skip-change facilities, and safety features to shield miners when entering the cage. Immediately west of the headframe is the primary crushing plant containing a 4x15-ft. apron feeder; 5x12-ft. vibrating screen; and a 36x25-in. jaw crusher set to 6 in. The final crusher product is transported via a 320-ft. incline conveyor belt to the loading plant consisting of two rows of circular steel bins equipped on top with a 36-in. belt conveyor with moving tripper and with air-operated loading gates at the bottom.

Hoisting equipment available in the steel-frame hoist house resting on a 24-in. reinforced concrete mat includes an Allis-Chalmers 3,000-hp. double-drum hoist; a Nordberg 2,250-hp. double-drum hoist; and two motor-generator sets, one for each hoist, to furnish direct current for the hoist motors together with diverse auxiliary and control units. Both hoists have control equipment for automatic hoisting. The cable used on the larger hoist operating the skips is 1-⅞ in., with 5,500 ft. of it held on each 12-ft. diameter drum. From the hoist house pipes, power cables and other shaft auxiliaries needing protection are carried to the Kelley shaft via a concreted tunnel.

600 Level Now Producing

Underground loading and ore storage facilities serve the Kelley shaft on the now active 600 level. Here, a short distance from the shaft and alongside the main track are two cylindrical ore pockets cut into solid rock and concrete-lined, reinforced with 60-lb. rails, measuring 14 ft. in diameter inside the concrete and 65 ft. high. One pocket is equipped with a pneumatic car cleaner unit, and retractable dump blocks are available to dump trains of loaded Granby-type cars when passing one or the other pocket. Principal reason for placing the storage pockets some distance from the shaft is to maintain ground stability in the immediate shaft area.

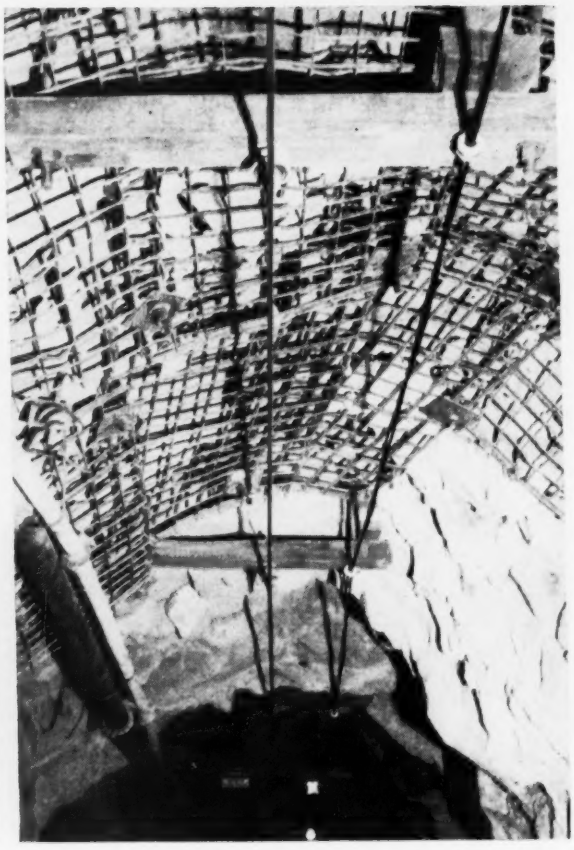
From the storage pockets the ore is fed by special drum-type feeders onto a 60-in. belt conveyor equipped with a magnet to remove tramp iron discharging into the skip measuring chutes at the shaft proper. The ore stream from the conveyor can be diverted to either chute by a truck-mounted hopper actuated by a long air cylinder. To load one 12-ton skip normally requires about 50 seconds.

Current ore production hoisted from the 600 level horizon is obtained from four separate block-caving zones, known as 6, 8, 9, and 11. Zones 9 and 11 are being mined on the 400 and 500 levels respectively, the ore drawn from producing blocks being directed to the main 600 haulage level via a transfer raise equipped with mechanically-operated gates. Daily production at the time of visit was running at the rate of 6,800 tons, and the management was confident that the 10,000 ton mark will be reached early in 1953.

Because of the unique character and composition of the Project orebodies and their extension to great depths, successful exploitation of such large areas of mineralized ground by block-caving methods presented quite a challenge to the technically trained operating man of today. Many initial difficulties and obstacles have been overcome by application of new ideas and modification of older practices in the development of blocks.

Blocks currently mined on the 600 level horizon are multiples of 30x80-ft. rectangles, called panels. Each block contains from three to eight panels. Haulage crosscuts are driven beneath the blocks along the center of the panel, or the centerline of the haulage crosscut is 40 ft. from either end of the panel. The grizzly and undercut levels are respectively 60 ft. and 78 ft. above

ROOF BOLTING eliminates timbering in part of the 600 haulage level. Note trolley wires bolted to ties.



STEEL GRIDS, held up by plates on the roof bolts, offer increased safety in loose-rock areas.

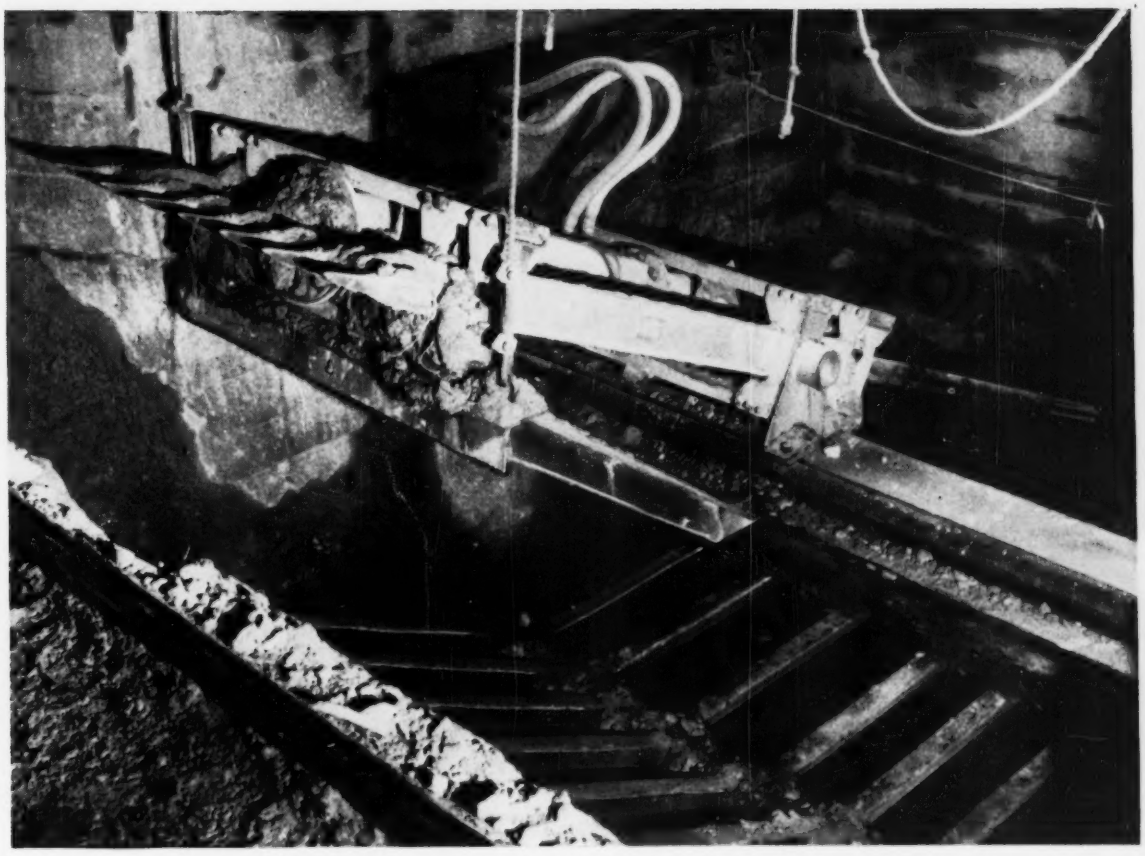
the floor of the haulage crosscut. In all 64 finger raises are extended from the grizzly to the undercut 18 ft. above, each finger tapping about 300 sq. ft. of undercut area. Details of the draw raises, timbering, chutes, and others are shown in the accompanying drawings, a set of which is carried by every underground shiftboss. The rail grizzlies below the finger raises are spaced 12 in., and the chutes at the bottom of the draw raises are 36 in. wide.

Ore drawn from the draw raises into 115-cu. ft. Granby-type cars with automatic couplings is hauled in trains from 15 to 20 cars over a loop haulage system to the storage pockets at the Kelley shaft. The locomotives used are 10-ton trolley units equipped with air brakes and sanders, using 250-v. dc and developing 120 hp. on two axles. The main haulage tunnels are 12x10-ft. in cross-section, with roof bolts and wire grids used in sections passing through ground requiring light support. Trolley wires are suspended from short wooden ties bolted to two roof bolts. The tracks are made up from 60-lb. rails laid on 36-in. gage. Subsidiary haulage is carried on with 6-ton battery locomotives and 57-cu. ft. Granby-type cars operating on 40-lb. rails laid on 18-in. gage. The 36-in. gage track has standard 75-ft. turnouts, and the 18-in. gage track standard radius curves, making switches interchangeable with the narrow gage. Direct current for the trolley locomotives is furnished by two 225-hp. motor-generator sets operating on divided circuit installed near the Kelley shaft.

Haulage Directed by Phone

Haulage operations are directed and controlled from a central dispatch station near the ore storage pockets at the Kelley shaft through a MSA mine phone installation. Here, the dispatcher, in addition to a loud-speaker and microphone, has before him a 100-scale map of the entire 600 haulage level upon which he can chart the movements of trains by inserting pegs at points indicated by the locomotive operator. The trolley wire serves both as a source of power and carrier for the speaking units on the locomotives and dispatch station. The installation enables the dispatcher to communicate with motor men, and no train movement is made without specific clearance from him.

For ventilation and dust control, an elaborate exhaust ventilation system has been installed which operates through existing shafts in the area, and through ventilation drifts driven around the caving zones on the grizzly-level horizons. Because the four production areas under exploitation are not contiguous, each caving zone is provided with a respective fan to induce positive ventilation. Fans producing air flow through extraction areas are in series with a main reversible mine fan. Two zones are provided with backward curved fans of safe-load type. This installation was possible because both the demand and orifice characteristics resulting in the resistance factor were both at a fixed level. In the other two zones axial flow fans with variable selec-



PNEUMATIC CAR CLEANER mounted over a 15x65-ft. concrete ore storage pocket near the Kelley shaft on the 600 level is designed to thrust itself into the open door of side-dump cars, and loosen and dislodge impacted muck.

tion of propeller pitch are provided. These fans were installed to allow flexibility in meeting the change of both volume and increase of resistance which is anticipated.

Electrostatic Dust Control

In tackling the dust problem in the Project area many new factors had to be considered. The chief reasons for the increase in dust concentrations anticipated are: (1) larger tonnages handled; (2) the immediate source of the ore stream is relatively inaccessible; and (3) increased number of passes of the ore stream through the atmosphere. Long before the Greater Butte Project began production the use of electrostatic precipitation was investigated. The units proved successful in some particular applications.

Dust particles having a maximum diameter of 10 microns or less are considered to be of pathological consequence. Knowing that 1 micron is equivalent to 1/25,000 in., the relative size of these minute particles can be appreciated. The electrostatic precipitator mentioned utilizes an ionizing chamber and two vertical curtains of charged plates of alternate polarity. The grounded or negative plates travel intermittently propelling a wiper. The moving plates course through a viscosine bath where adhered particulate material is removed by a stationary wiper and drops as sludge into a sump. It is apparent that the acceleration of the negative electrons greatly increases as they approach the highly stressed electrical field surrounding the ionizing wires. The electrons moving at high speed impact upon gas molecules causing them to lose negative electrons which results in the gas molecules having a positive polarity. Dust particles which may or may not possess a charge are surrounded by a number of positively charged gas molecules causing a mass attraction effect. The negatively charged plate attracts the particle and retention occurs in the viscous film on the plate.

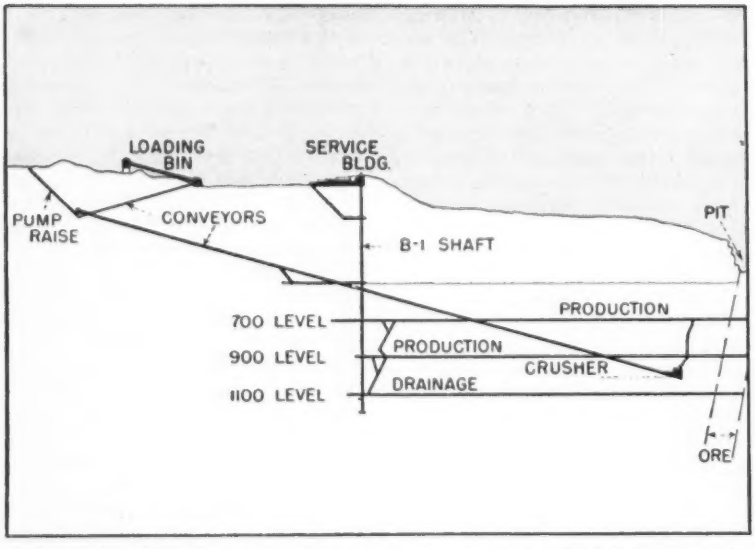
Velocities through the spaces between the plates must be kept at low magnitude. If the component of velocity exceeds the resultant of electrical attraction in the plane normal to travel, the particle will pass through the electrical field without deposition. Briefly, dust particles are subjected to the effluence of air motion and are careless in nature until they approach the ionizing field where they begin to develop concern and shortly thereafter they are subjected to attraction and retention. Pollen, mold spores and bacteria have no means of locomotion but can readily choose a dust particle as a means of conveyance. The process described provides the means for hygienically cleaning the environment.

Dust-collecting units have been and are being installed at points where large tonnages are dumped into transfer raises, ore storage pockets, skip loading pockets, and on the surface at the primary crushing plant, and ore loading bins. A new dust collector developed by the company, known as the wet impact unit, has proved highly effective.

ERRINGTON OPEN PIT, here seen, will be replaced after 1953 by underground mine now being developed on lower portions of "B" ore zone. Annual production scheduled is 1½-million tons. It will replace the present output.

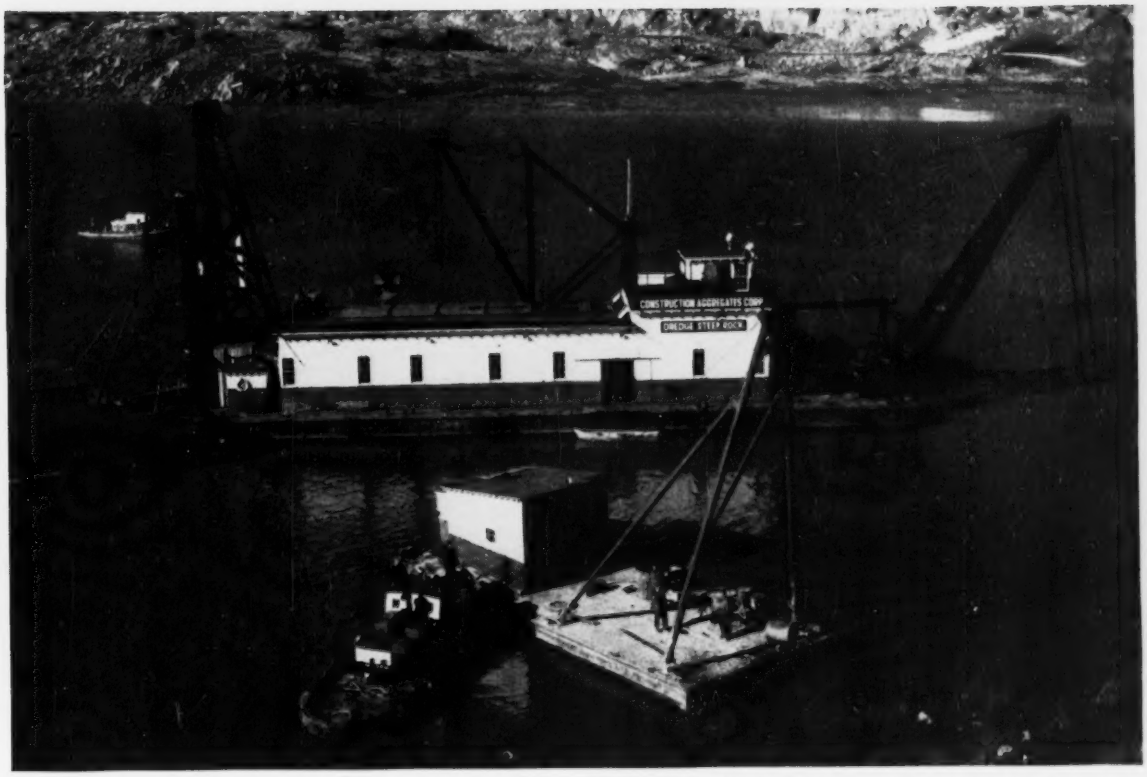
Steep Rock's "A" and "B" Zones To

K. L. McRORIE, Chief Engineer
Steep Rock Iron Mines Ltd., Steep Rock Lake, Ont.



A DRAINAGE LEVEL beneath two production levels is called for in plans for Errington underground mine. See adjacent drawing for sump arrangements.

THE STORY OF the successful search for the iron ore underneath the waters of Steep Rock Lake in Ontario, the presence of which had been indicated by pieces of float found on an island in the lake, has often been told in the past decade (see *E&MJ*, Dec., 1943, pp. 86-91; also Aug., 1948, pp. 84-85; and April, 1952, pp. 83-85). Highlights of this story have been the exploration drilling done, the eventual gratifying disclosure of the hematite ore in the drill cores obtained, and the subsequent gigantic scheme for diverting the waters entering the lake and lowering the lake level to uncover the top of the Errington, or "B" ore zone, so that mining might begin. Open pit mining on the Errington did begin late in 1944, since when about 8¼-million tons has been mined and shipped. At this point, Mr. McRorie, Steep Rock's chief engineer, picks the story up, to tell about the plans the company has in hand for opening an underground mine beneath the present open-pit workings on the Errington orebody and for



TO STRIP 50-MILLION CUBIC YARDS OF SILT from Hogarth orebody, or the "A" ore zone where iron ore was first disclosed by drilling, two dredges have been installed. The "Steep Rock" has already removed a large yardage.

Yield 3½-Million Tons Per Year

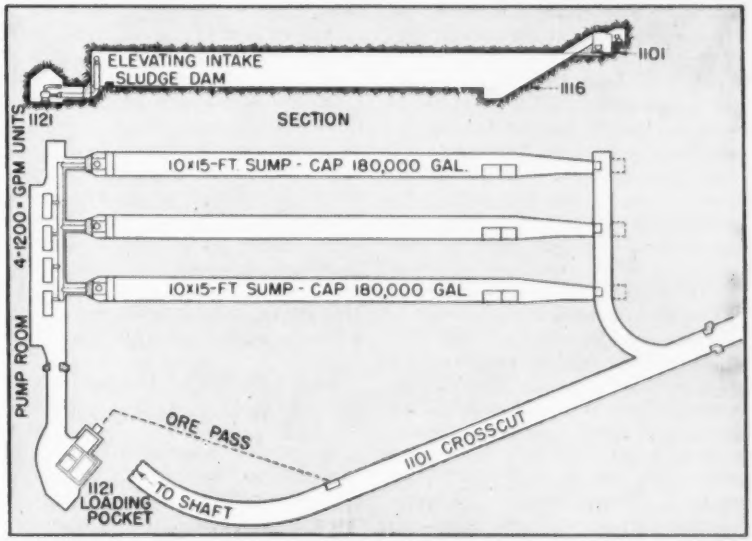
preparing the Hogarth orebody for exploitation by open-pit methods.

From Open Pit to Underground Without a Headframe

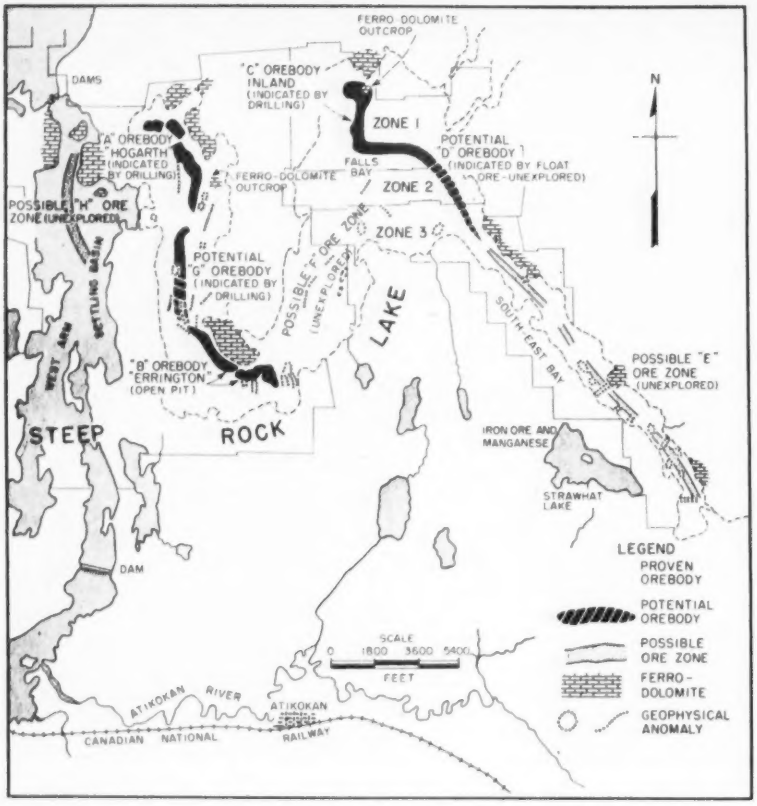
The current mining and stripping operations on the Errington orebody are conducted with five 2½-cu.yd. diesel shovels and three 4-cu.yd. electric shovels. The ground is drilled with 9-in. churn drills for blasting and the broken material is loaded into 22-ton diesel trucks. At present over a million dollars worth of these trucks is engaged in the operation.

Work is proceeding on the development of the first underground mine on the Errington zone. This underground mine has been designed for an ultimate output of 1,500,000 tons per year. The plant will incorporate some novel installations which we believe are unique in Canadian mining practice.

The Errington open pit has been developed from the hanging-wall side of the orebody. The shops, access roads and railway spur are all of necessity on this side. When underground operations were first contemplated, studies were made to



DRAINAGE LEVEL in Errington mine will have three settling sumps with total storage capacity of 540,000 gal. Entire level can be flooded if needed.



OREBODIES, proven, potential and possible, at Steep Rock Lake are mapped as shown by mining company, on strength of compiled data.

provide footwall access to the orebody. However, it was almost impossible to gain access across the lake with a railroad spur and these plans were abandoned. The island on which the original float ore was first found provided the nearest access from the hanging-wall side and was chosen for the shaft site. The island is dome-shaped and about 60 ft. high. Studies suggested that considerable excavation could be eliminated by countersinking the headframe right in the hill, and that a headframe could be eliminated by reversing the usual procedure and putting the bins just below the collar. The result is that just the head sheaves protrude above the top of the hill.

The 60 x 200-ft. change house is a double-story concrete building which houses shops and heating plant on the main floor, and change rooms, offices, first aid and lecture rooms for about 300 men on the second floor. Arrangements have been made for a third floor when required. This building is also countersunk into the hill and access to the shaft is provided by a 200-ft. tunnel which also provides warm storage for supplies going underground. We believe this installation will provide real savings in heating, and the extreme weather temperatures to which we are sometimes subjected during the winter will not be a problem.

The hoist house is set in an indentation in the hill and is connected by a tunnel to the shaft and change house. The hoist is a 120x 72-in. double-drum type powered by a 700-hp. motor. Air is supplied by three 2000-ft. compressors. The all-steel 13x13-ft. shaft has been sunk 1200 ft. deep and is purely a service shaft. It contains a manway and a 5x12-ft. service cage in balance with a 6-ton bottom-dump skip for handling development rock. The rock is conveyed from the waste bins below the collar to surface by a 200-ft. waste conveyor.

Two Levels for Production, One Drainage Level

Initial development is being carried out on three levels at 200-ft. vertical intervals. The openings were expected to crosscut the orebody about the end of February. The two upper levels have been planned as production levels and the third level as a drainage level. Three primary pumps, each with a capacity of 1200 U. S. gal. per min. against a static head of 1200 ft., are installed on this drainage level. An elaborate system of settling sumps has been excavated to provide a combined storage capacity for over 500,000 gal. In case of emergency the whole drainage level can be flooded without damage to the pumps, thus providing additional storage for 1,700,000 gal. Every reasonable precaution has been taken to insure adequate pumping facilities if water should prove to be a problem. The pump station will remain permanently on this level, and, as mining operations proceed to depth, it will eventually be the final booster station.

The ore will be hauled to the ore pass above the underground crusher station in 200-cu.ft. hopper-bottom cars. This station is below the second level and just outside the hanging-wall contact. The ore will be crushed to minus 8 in. and loaded on a four-flight 36-in. underground conveyor system, inclined to 16 deg., and will emerge at the surface screening plant at a distance of some 4000 ft.

Mining operations will be conducted on a year-around basis, although shipping will be confined to about six months of the year. Arrangements will be made for stockpiling at least half a million tons of ore per year during the period when lake navigation is suspended.

Stripping Hogarth Orebody Now Under Way

The Hogarth ("A") orebody lies about 2 mi. north of the Errington pit. It is now being stripped in preparation for open-pit operations in the late summer of 1953. This orebody is the larger of the two presently explored orebodies in the Middle Arm of Steep Rock Lake, being roughly three-quarters of a mile long with widths in excess of 300 ft. The ore is known to exist to a depth below 1000 ft. and is believed to extend to much greater depths.

Recent drilling has disclosed another large orebody lying between the Hogarth and the Errington orebodies. At present, this area is known as the "G" orebody. Although sufficient drilling has not been completed to outline the zone fully, it now appears that the ore zone is continuous from the Errington through the Hogarth, except for minor faulting, a distance of 13,000 ft.

The "C" ore zone, which was discovered in the East Bay in 1940, has been optioned to Inland Steel Co. (see article below). Winter drilling programs from the ice have proved a substantial tonnage of high-grade ore, and we look forward to the day when a very sizeable mining operation will be conducted in this zone.

Although the original strike was made on the Hogarth orebody, its development was postponed in favor of the Errington zone in 1943. The Steep Rock orebodies are all found in the bed of the lake and are overlain with a thick blanket of varved clay. This is the result of countless years of deposition of the clay or silt carried into Steep Rock Lake. Somewhat like the rings of a tree, each varve has two layers which represent a cycle of one year; the sandy layer representing the material laid down by the spring freshets and summer rains, the fine-grained layer representing the deposition of fine silt which is allowed to settle after the ice is formed and the stream velocities are low. To the trained geologist, the history of the past is unfolded, the thickness of the various layers indicating periods of high precipitation and periods of drought.

Fifty Million Yards of Silt Above Hogarth Ore

The Hogarth zone is overlain with approximately 50-million cu. yd. of this lake bottom silt. Preliminary studies were commenced in 1946 with a view to developing this orebody. Financial arrangements were completed and a contract for the removal was let in 1949. The dredging project began in December, 1950, with a 30-in. cutter-type dredge, aptly named "Steep Rock." More recently, after the discovery of the "G" orebody which is also covered with an equal amount of silt, a similar 28-in. dredge named "Marmion" was built and put into service in October of 1952. The dredge "Steep Rock" is capable of excavating about 1,500,000 cu.yd. per month, while the new dredge is designed to produce at about 80% of this figure. The entire dredging plant requires about 25,000 hp., or an amount of power sufficient to supply a residential city of about 50,000 people.

The Hogarth orebody is scheduled to begin open-pit operations in August of this year (1953). A preliminary pit has been designed to produce 17 million gross tons of iron ore, although a decision to go deeper may be made when the comparative costs of open-pit and underground mining are known. Production of ore from the Hogarth orebody, or the "A" zone, is expected to reach 2-million tons annually by 1955.

New Plant for Hogarth Also

Preparations are being made for the construction of a new plant which will be put in operation for the opening of the 1954 mining season. The initial production will be hauled to the Errington plant this year. The Hogarth plant will consist of a crushing plant situated at the pit, a 3500-ft. conveyor, and a screening and loading plant. The 36-in. conveyor-way is divided into four flights, each powered with a 250-hp. squirrel-cage motor. Across-the-line starting is accomplished by the use of scoop-controlled fluid couplings. The belts are designed to convey 1100 tph and travel 566 fpm. Arrangements will be made to divert the ore to stockpile grounds in proximity to the loading plant when required.

The site for the Hogarth screening and loading plant has been chosen to fulfill two functions; that of handling the ore from the Hogarth pit and subsequently to handle the additional volume of ore from the "G" open pit. The screening plant is being designed to handle 3.5-million tons in six months. Later, the same facilities can accommodate future underground operations on the Hogarth zone. The opening of this new pit will require new service shops, change-house facilities and the construction of 3 mi. of railroad spur over difficult terrain.

The current development program calls for a stabilized production of about 3½-million tons annually. Because of the great increase in the demand for iron ore, the company is considering a much larger expansion program than that we have just described. The geological evidence available is thought to justify it.

Cayia To Direct Inland Steel's Project at Steep Rock Lake

A. J. CAYIA has been appointed vice president and general manager of Caland Ore Co., Ltd., Canadian subsidiary of Inland Steel Co., with responsibility for directing the $50-million iron mining program Caland will undertake on claims the company has leased at Steep Rock Lake, northwestern Ontario (see *E&MJ*, March, 1953, p. 126). The appointment was announced March 4 by P. D. Block, Jr., president of the subsidiary and vice president in charge of raw materials for Inland. Mr. Cayia, who joined Inland in 1928 to develop the company's limestone operation at Manistique, Mich. and Port Inland (Mich.), has been manager of Inland's iron mines and quarries since 1946.

Caland Ore Co. is to be a Canadian operation in all respects, with full autonomy for developing the project except for overall direction by the parent steel company. So far as possible, all personnel will be Canadian.

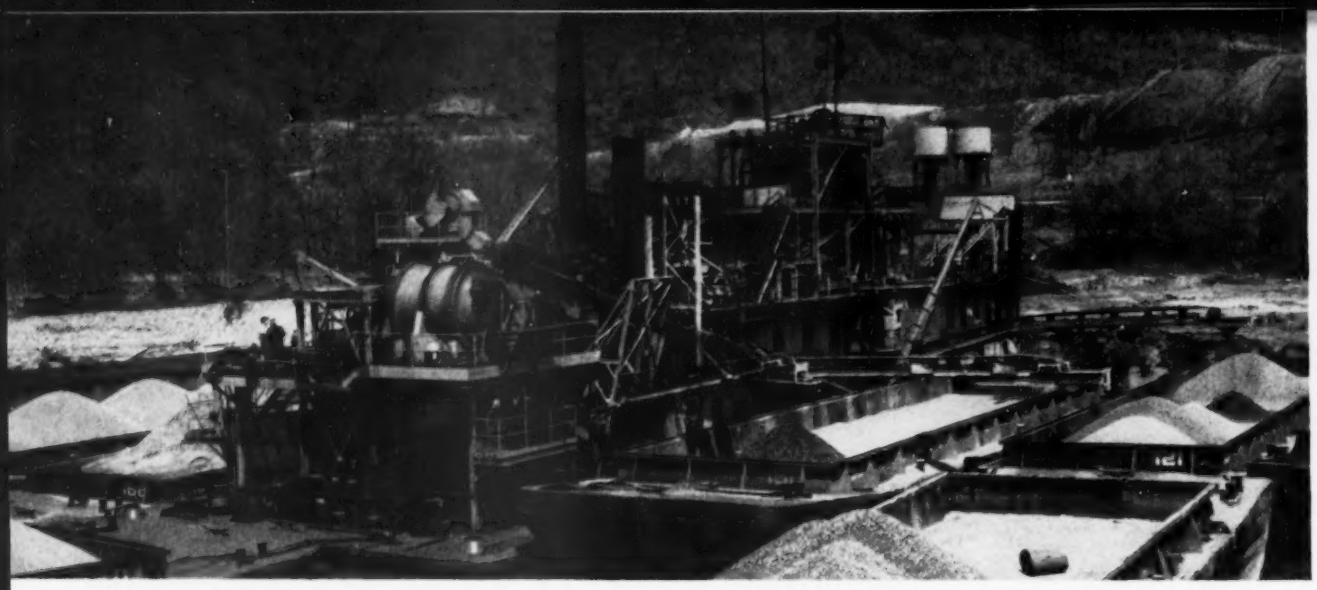
An output of 3-million tons of iron ore per year is planned by Inland at Steep Rock when full production is attained, according to Mr. Block. He estimated this will take seven years.

Drilling and exploring by Inland has continued on the lease area the past winter as during the preceding three winters. The undertaking of bringing the Caland mine into operation will be started as soon as possible. The first phase will be the removal of overburden to expose the orebody for mining. Underground mining methods will probably be used.

This development is attractive to Inland Steel because Port Arthur, Ont., which will be the port for shipment down the lakes, is 120 mi. nearer to Inland's steel plant at Indiana Harbor than is Superior, Wis., shipping point for ores from the Mesabi Range.

A 3- or 4-mi. spur will connect the Caland operation with the Canadian National Railways. The lease covers 1,200 acres in the Falls Bay area of the lake. The deposit, which is also known as the "C" orebody, is one of the orebodies made accessible since 1943 by the operations of Steep Rock Iron Mines, Ltd.

The story of the current operations and plans of Steep Rock Iron Mines, Ltd., is given in the preceding article by K. L. McRorie in this issue.



FLOATING HMS PLANT treats 225 tph of gravel dredged from Ohio River, helps make better concrete aggregate. Note drum separator, feed conveyor, other usual HMS plant equipment. Barges haul cleaned gravel to shore.

New HMS Plant Provides Low-Cost, High-Quality Gravel

W. L. PRICE, Engineering Manager,
Keystone Division,
Dravo Corp., Pittsburgh, Pa.

FOR SEVERAL YEARS, Dravo Corp. has been active in research for methods to improve the quality of river gravel for use as aggregate for concrete. Objectionable particles of "soft" gravel, porous gravel, and foreign materials, such as coal, wood, and clay were constant detriments to this desired high quality aggregate. "Soft" gravel similar to loosely bound sandstone caused a high loss in the Los Angeles rattler test[1] (an abrasion and impact test) and broke up in the sodium sulphate soundness test.[2]

After learning of the success of the Royal Canadian Air Force[3] in removing shale particles from their gravel by means of the differences in specific gravity (shale—sp. gr. 2.0, gravel sp. gr. 2.4 to 2.9), a preliminary study was made of samples of the Dravo gravel deposit by sorting out individual particles by specific gravity. This study indicated, first, that there was a variation in specific gravity in the deposit and, secondly, that in general the softer or more undesirable gravel lay in a lower range of specific gravity than did the harder material. With this encouragement, a sample of 40 tons was sent to the American Cyanamid Co. for a test run in their laboratory.

At the American Cyanamid Co. laboratory, the gravel sample was separated at operating specific gravities ranging from 2.30 to 2.50. Examination of the float product showed again that the soft objectionable particles predominated in the range of low specific gravities. Los Angeles rattler tests showed that by increasing the specific gravity, it is possible to improve the feed from a 38% loss to a 28% loss, considerably below the allowed 35%. A high rattler loss on the float product indicates the soft quality of the gravel removed.

Design of Plant

The results of these tests provided the only data of its kind on gravel. It proved encouraging enough to study further the construction of a Heavy Media Separation plant. At present, the gravel is dredged from the Ohio River, screened, and the finished products loaded into barges.

It was decided to use a separate floating Heavy Media plant lashed to the dredge and fed by conveyors. There were numerous difficulties involved. One was to get all the necessary equipment on a small hull in the proper location in the flow scheme. The other was the question of the stability of a small floating hull and its possible effect on the process. These and other serious problems were resolved and the first floating Heavy Media Separation plant was then designed and built by the Engineering Works Division of Dravo Corp.

Plant Specifications

The equipment and structure were mounted on a specially designed hull 50 ft. wide, 40 ft. long, and 7 ft. 6 in. deep. The hull is subdivided into 14 watertight compartments around the perimeter so that any one compartment could be flooded without sinking the plant. The plant is fed by a conveyor belt extending from the former loading point on the dredge to the feed hopper at the top of the new plant. The finished gravel product is loaded onto two 500-ton capacity barges moored alongside. The waste product can either be wasted back into the river or dumped onto a conveyor belt leading back to the crush-

[1] Los Angeles Rattler Test—A.S.T.M. C-131.
[2] Sodium Sulphate Test simulates a freezing and thawing action—S.S.T.M. C-88-46T.
[3] "Mining Process Applied to Runway Construction," by S/L C. V. Trites, M.E.I.C., and S/L J. D. Shannon, Air Material Command, Royal Canadian Air Force, 1949.

er on the dredge for crushing to sand, the latter being an experimental feature. The flow of gravel through the plant can be observed in the flowsheet.

Plant Performance

This plant was put in operation in April of 1952 and started production in May, operating through the 1952 season. In this short period of operation, it is impossible to fully evaluate the improvement of the gravel. The plant has lived up to expectations thus far. Rattler tests have been improved sufficiently to supply aggregate where a 35% rattler loss is permitted. The results of the sodium sulphate soundness test indicate a very comfortable margin of safety. In general appearance, the gravel has improved tremendously.

One added feature of this plant is that it will permit dredging for gravel in contaminated areas previously rated unuseable. This applies particularly to streaks of granulated coal found in the deposit as well as other deleterious material. In a deposit where the gravel needs no real improvement but is contaminated with coal, the operating gravity may be lowered to 2.10 to 2.20 to remove only coal and wood.

Plant Operation

The plant is designed for a one-man operation. The operator's only fixed duties consist of checking specific gravity of the medium and making necessary adjustments. The gravity is checked by weighing a measured sample of medium on a beam balance which reads specific gravity directly. The remainder of the operator's time is spent in lubrication and maintenance.

The total power requirement for the plant is about 90 to 100 kw. including conveyors.

The estimated magnetite loss is about 1 lb. per ton of gravel feed. Ground magnetite is available at a cost of about $40 per ton delivered.

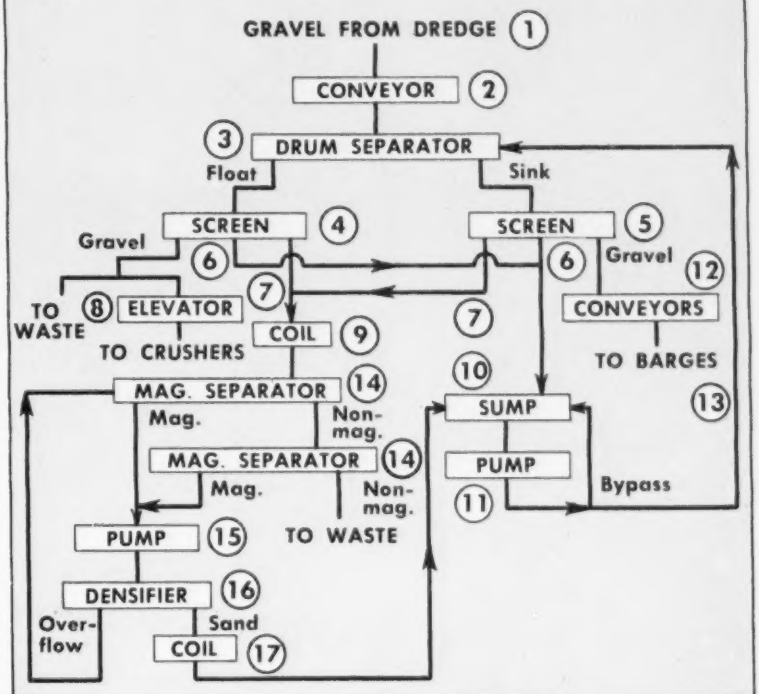
Repairs have been minor thus far. Medium piping suffers from some abrasion which occurs at elbows, turns, and other places of turbulence. A recent development in the field is the use of rubber hose for pipe bends. All piping bends should be designed for minimum turbulence. The only other major maintenance item has been occasional replacement of screen plates.

Due to the specific operating requirements, this plant described would be more costly to erect than the land plant counterpart. After sufficient operating data is accumulated, it will probably be possible to integrate this equipment more directly into the flow scheme of gravel processing, with the medium recovery screens serving as the final gradation screens.

Much additional experimentation is necessary. Although it has proved of value in this particular deposit, each gravel producer, if interested in this process, should investigate carefully the analysis of his particular deposit and check it experimentally before an investment is made in a plant of this type.

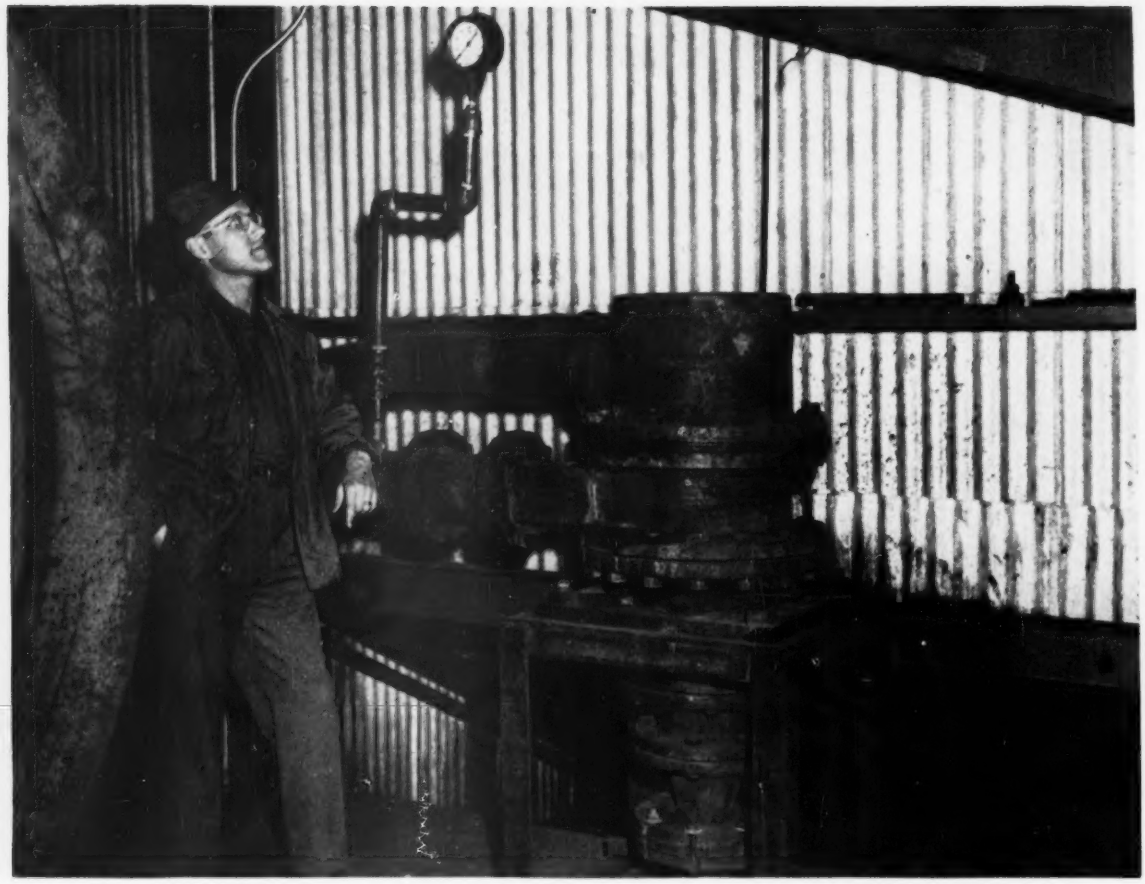
This entire project, since it is the forerunner of others in the gravel industry, will offer much in the way of working data on the process for this particular application. In the future, with the average gravel producer being forced to work less desirable gravel deposits, this process could prove to be the only practical way to produce sound aggregate from poorer deposits.

HMS PLANT FOR GRAVEL PREPARATION
DRAVO CORPORATION — Neville Island, Pa.



LEGEND

1. Gravel dredged from Ohio River, delivered to HMS plant at maximum rate of 225 tph., average rate of 150 to 175 tph., at either of two sizes, 2½x1-in. or 1¼x⅜-in.
2. Conveyor belt, 100 ft. x 24-in. 10 hp.
3. Western Machinery Co. drum-type separator, 8x8-ft., 2 rpm., 7.3 tons of magnetite medium, 15 hp. motor.
4. Float screen, double-deck, 3x16-ft.
5. Sink screen, triple-deck, 6x16-ft., water sprays on float and sink screens from 500-gpm. pump.
6. Undiluted medium drains and goes to sump.
7. Diluted medium, washed from gravel by sprays, goes to cleaning circuit.
8. Float gravel goes either to waste well or to elevator to return to dredge for crushing to sand products.
9. Memco magnetizing coil, 8-in., 0.4-kw.
10. Medium collecting sump, 272 cu. ft.
11. Medium return pump, Wemco, 6-in., 1,000 gpm.
12. Two 24-in. loading conveyors for sink gravel, 160 tph. total.
13. Barges, 500-ton, for sink gravel.
14. Two 48-in. Memco belt-type magnetic separators in series.
15. Medium return pump, Wemco, 3-in., 250 gpm.
16. Wemco spiral rake densifier, 4x29-ft., 21 tons maximum storage.
17. Demagnetizing coil, 6-in., 2-kw.



THE 15-IN. CYCLONE in the Holman Cliffs pilot plant. This unit is shown at "6" in accompanying flowsheet on p. 90. Looking over the installation is R. A. Derby, one of the authors of this article and operator of the pilot plant.

Pilot Cyclone Plant Paves Way for Two Full-Scale Operations

Experience with this newest of heavy-density separators shows that much has still to be learned about its operating characteristics.

W. R. VAN SLYKE
Range Metallurgist
and
R. A. DERBY
Operating Metallurgist
Cleveland-Cliffs Iron Co.
Taconite, Minn.

DURING THE PAST DECADE, iron ore beneficiation practices on the western Mesabi Range have changed gradually, reflecting the utilization of lower-grade wash, "near wash," and "retreat" ores.

In the days of the true wash ores, with the siliceous gangue material concentrated primarily in the —65-mesh size ranges, a simple washing treatment was all that was necessary for the most part to produce a merchantable overall concentrate. As these ores were mined and it became necessary to "retreat" the washed +$\frac{3}{16}$-in. fractions by means of a conventional heavy-density circuit, it also became increasingly evident that contaminating silica was occurring in greater percentages in the —$\frac{3}{16}$-in. +65-mesh fractions. Parenthetically, it should not be assumed that the fine fractions of the overall concentrate were uniformly favorable even when what was considered "wash ore" was being processed. Efforts to improve the grade of the fine fraction have been made since crude ore was first beneficiated on the Mesabi. Examples of these efforts were the use of turbo-washers, bowl classifiers, tables, rheolaveurs, selective-media concentrators and

others. More recently, however, plant flowsheets had to be still further changed to treat this ore so that an acceptable concentrate could be produced.

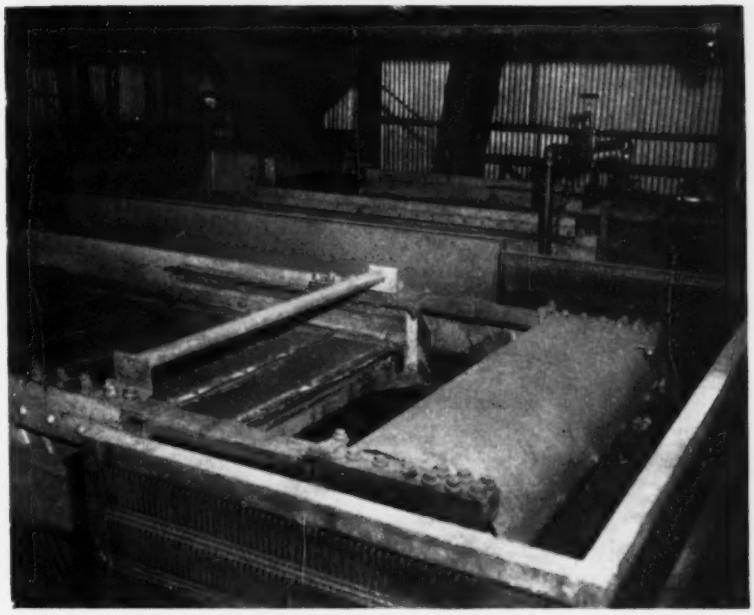
Generally speaking, there were five principal methods used in this connection, with minor variations as the structure of the ore being treated would make necessary. They are as follows:

1. Double classification or, as more commonly practiced, two-stage classification.
2. Single - stage classification followed by abrasion milling and desliming of abrasion mill product.
3. Classification and spiral treatment.
4. Single-stage classification followed by abrasion milling and spiral treatment.
5. Jigging.

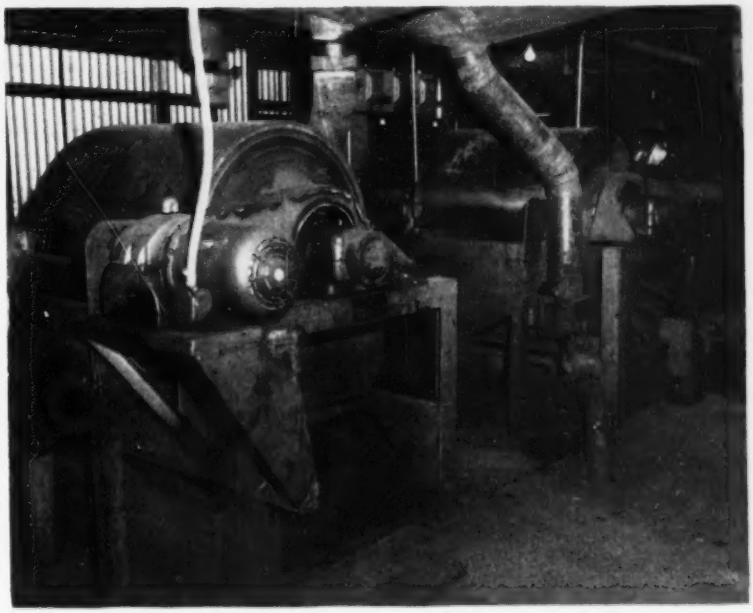
For several years, use of any of these practices for treating fines, coupled with heavy-medium treatment of the coarser size ranges, was generally adequate to meet the grade requirements of the various concentrating plants. As the trend toward lower-grade retreat ores continued, these methods for beneficiating the fine fraction could no longer be relied upon to produce a satisfactory grade of concentrate. It was at this time that consideration was given to the possibility of treating the fines, usually considered the —$^{3}/_{16}$-in. + 65-mesh fraction, by means of heavy-density separation, using the Dutch State Mines cyclone separator.

Cyclone Plant Is Built

The first test work on iron ore samples was done by the American Cyanamid Co. at their laboratory in Stamford, Conn. These preliminary tests were encouraging enough to warrant work on a larger scale, and in the fall of 1948, a large number of semi-continuous and batch-scale tests were conducted at the University of Minnesota Mines Experiment Station. On the basis of the data gathered from these tests, a continuous pilot plant was erected and operated by the M. A. Hanna Co. at their Buckeye mine during the 1949 season. This pilot plant work was continued during the 1950 season and was accompanied by several changes in the size and design of the cyclone as well as some flowsheet changes. In 1951, the flowsheet was enlarged to a two-unit, full-scale production plant and was operated in 1951 as well as during the 1952 season.



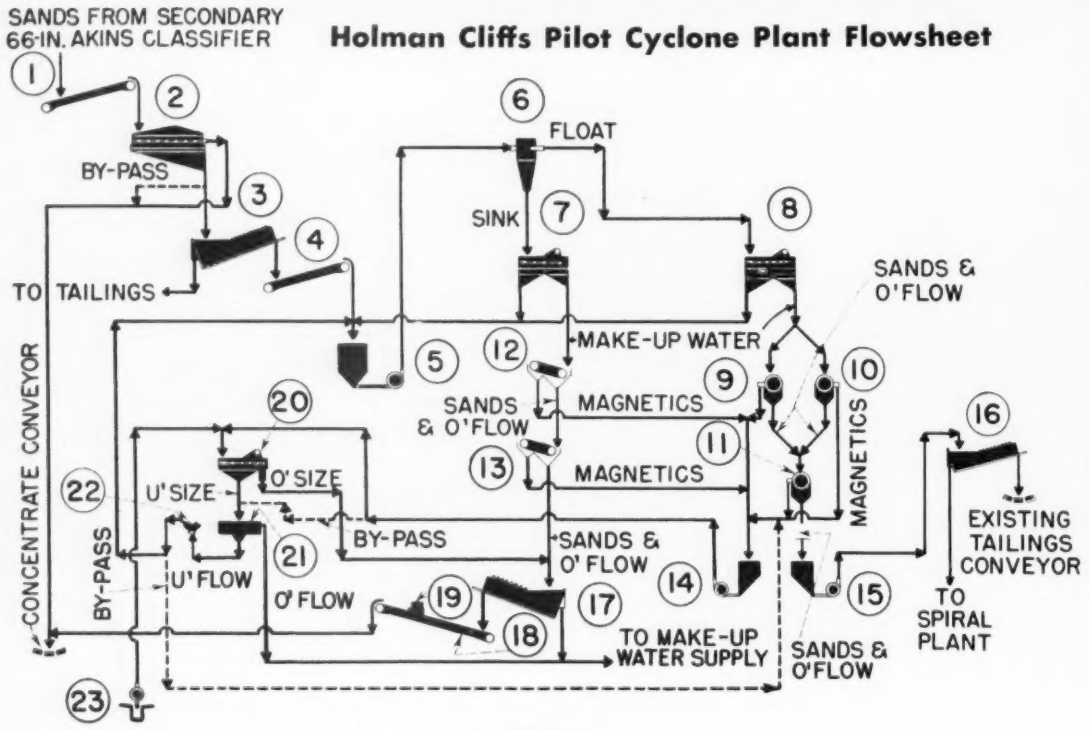
ON THE SCREEN FLOOR of the cyclone pilot plant. Reject screen occupies the foreground. Concentrate screen and tramp screen (see flowsheet) are beyond it in far background.



THESE TWO PRIMARY MAGNETIC SEPARATORS, each of the drum type and of Jeffrey make (Type C), are the units shown at "9" and "10" respectively in the flowsheet. Each takes 2 hp. Plant equipment also includes magnetic separators of the belt type.

In the fall of 1950, following the pattern set by the Hanna company, the Mesaba Cliffs Mining Co. (subsidiary of Cleveland-Cliffs Iron Co.) laid the plans for a 50-ton per hour cyclone pilot plant to be constructed at their Holman-Cliffs mine at Taconite, Minn. Ground was broken early in 1951 and the plant was completed that fall, to the extent that most mechanical difficulties encountered in the flowsheet could be corrected. Test work was started shortly after the start of the ore season in 1952 and continued throughout the year excepting the months of June and July during the steel strike.

Holman Cliffs Pilot Cyclone Plant Flowsheet



LEGEND

1. Belt conveyor, 24-in., 3 hp.
2. Tramp screen, Symons, 4x8 ft., 7½ hp.
3. Akins dewatering classifier, 60-in., 10-15 hp.
4. Belt conveyor, 24-in., 5 hp.
5. Sand pump, 6-in., 100 hp.
6. Cyclone, 15-in.
7. Symons screen, 5x8-ft., single-deck, Type F, 5 hp.
8. Symons screen, 5x8-ft., single-deck, Type F, 5 hp.
9. Jeffrey drum separator, 36-in., Type C, primary, 2 hp.
10. Jeffrey drum separator, 36-in., Type C, primary, 2 hp.
11. Jeffrey drum separator, 36-in., Type C, secondary, 2 hp.
12. Dings magnetic separator, 48-in., primary, 5 hp.
13. Dings magnetic separator, 48-in., secondary, 5 hp.
14. Sand pump, 4-in., 20 hp.
15. Sand pump, 3- in., 10 hp.
16. Classifier, 36-in., in HMS plant.
17. Akins dewatering classifier, 60-in., 10 hp.
18. Belt conveyor, 24-in., 5 hp.
19. Weightometer.
20. Tramp screen, Symons, 5x8 ft., single-deck, 5 hp.
21. Thickener, 30 ft. x 8 ft., 3 hp.
22. Dorrco duplex diaphragm pump—two units, 3 hp. each
23. Amsco-Nagle vertical sump pump, 2½-in., 10 hp.

Flowsheet. The flowsheet of the pilot plant shown consists basically of an ore circuit and a medium-cleaning circuit, the latter being made up of separate cleaning circuits for the sink and the float products. It is of interest to note that belt-type magnetic separators are used on the sink side and drum-type separators on the float side. In addition, it should be noted that one of the primary drums is of the concurrent type, that is, the feed travels with the rotation of the drum; the other primary drum is of the countercurrent type in that the feed enters against the drum's rotation. The secondary drum is also a countercurrent-type machine. The reason for installing different types of magnetic separators was the desire to find that type of machine which would best meet the needs of the cyclone flowsheet.

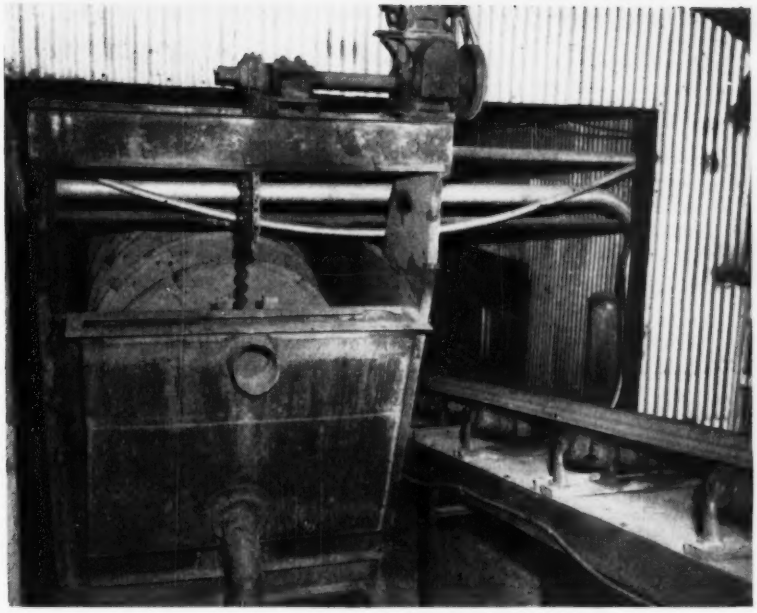
Medium. Throughout the operation the medium used was a finely ground magnetite obtained from the concentration of naturally occurring magnetic taconites at the Erie Mining Co.'s taconite plant at Aurora, Minn. This material has a specific gravity of approximately 4.5 in the dry state. Composites of several different samples of this medium reveal the following structure:

Size	% Wt.
+ 65	0.28
+100	1.20
+150	3.22
+200	7.20
+325	21.30
—325	66.80
Total	100.00

These figures may vary slightly, but the material usually runs from 65 to 75% minus 325 mesh.

Feed. A portion of the sands product from one of the secondary spiral classifiers in the main washing plant constituted the feed to the pilot plant. This material ranged predominantly from —⅛ in. to 65 mesh in size with some smaller amounts of —65-mesh material. The feed was dewatered in a 60-in. spiral classifier with a 22-deg. slope and, as delivered to the cyclone feed sump, averaged approximately 21% free moisture.

Medium Circuit. The medium to the cyclone feed sump was made up primarily of thickened underflow from the 30-ft. rake thickener in addition to varying amounts of drain medium returned directly from the drainage screens. The



FEED TO CYCLONE PLANT is dewatered on this 60-in. Akins spiral classifier before entering the cyclone. It is shown at "3" in the flowsheet. At the right is the feed conveyor belt, indicated at "4" in flowsheet.

amount of drain medium returned to the feed sump could be regulated by a sliding pan underneath the float screen. In cyclone operation, a far greater amount of medium appears at the float drain screen than the sink drain screen. This is characteristic of all cyclone plants. For this reason, the sliding pan to control the distribution of circulating medium was placed under the float drain screen. That portion of the circulating medium not returned to the feed sump was sent through the magnetic separators for cleaning and recovery of the magnetite and the cleaned magnetics were thence sent to the thickener.

Some Difficulties

Several mechanical and operational difficulties were encountered during the season. Some of them were inherent in this particular installation rather than in cyclone plant operation in general. They were as follows:

1. The generally high grade of the feed was in all probability the most difficult obstacle that had to be overcome. It follows logically that the pilot plant was an adjunct to the main concentrating plant, which necessarily had to produce a merchantable overall product. Hence, the pilot plant had to accept the grade of feed which was presented to it. Generally speaking, the split between the sink and float was in the ratio of 4:1. Since the original flowsheet was designed to treat a feed which would more nearly approximate a 3:2 separation ratio, the uneven split mentioned resulted frequently in the concentrate circuit being overloaded, while the float circuit was operating under capacity, with regard to the nonmagnetics in the circuit. When this condition existed, it made necessary a reduction in tonnage of the feed that could be fed to this unit. It is true that the tonnage of concentrate produced through a cyclone is a function of the diameter of the apex opening and that by enlarging the apex, a greater tonnage can be handled. But in the existing flowsheet, such a move was in large measure prevented by the size of the drain screen and the magnetic separator capacity in the concentrate circuit.

There is some question that cyclone treatment is not justified in beneficiating all grade of —$\frac{3}{16}$-in. +65-mesh material. Cyclone treatment will not be installed until it is necessary to produce a satisfactory overall concentrate. It goes without saying that this is a problem that must be evaluated on an individual basis.

2. Adequate feed preparation is another factor which causes difficulty in good cyclone operation from several viewpoints. Primarily it should be as free of surface moisture as possible. As delivered to the cyclone plant under the existing flowsheet, the feed contained approximately 21% free water (free water is defined as the percentage by weight removed by spinning for three minutes in a centrifuge). This amount of free water, when attempting to treat high tonnages for long periods of time, resulted in a drop in operating gravities, which could only be offset by pumping a larger quantity of high-gravity thickener underflow into the system. This required pumping an underflow gravity in excess of 2.50. With clean medium, this gravity is well within the pumping capacity of the diaphragm pumps currently in use. However, with an increase in the viscosity of the medium, caused by a build-up of —20 mesh nonmagnetic particles in the system, it becomes much more difficult to handle and, as a result, the diaphragm pumps frequently plugged.

Coincident with reducing the moisture content of the feed was the proper sizing of the feed. Ideally, the range of the various size fractions should not be too great, inasmuch as gravities high enough to float coarse silica carried some fine iron also, resulting in a loss of iron in the finer sizes. As a general rule, the —$\frac{1}{8}$-in. feed to the Holman cyclone plant was 90-95% +65 mesh.

3. Medium loss is a constant challenge to the operator of any heavy-density installation. Intermittent operation of the pilot plant made it very difficult to reconcile overall losses with those observed through the magnetic separators and over the tramp screen. Had the plant been running as a production, rather than a pilot unit, these figures would be much easier to reconcile. On the basis of medium-loss tests made throughout the season, losses of 8 lb. per ton of feed were encountered. It should be re-emphasized that these loss figures are higher than would be expected in a production plant running continuously. In addition, it is anticipated that planned improvements in the plant flowsheet will also effectively help to reduce these average loss figures.

4. Tramp oversize material building up in the circulating medium was another source of operating difficulty. This was a direct result of the failure of the magnetic separators completely to

Table 1. Average Analyses of Cyclone Feed, Concentrates and Rejects

Product	% Fe	% Sil.
SEASON'S AVERAGE		
Feed	55.98	13.36
Concentrate	57.76	10.78
Tailings	41.88	31.12
INDIVIDUAL TEST RUNS		
Feed	53.20	14.30
Concentrate	56.40	9.00
Tailings	33.10	40.70
Feed	55.50	12.70
Concentrate	56.80	11.00
Tailings	45.50	26.30
Feed	54.20	16.80
Concentrate	58.80	10.10
Tailings	40.70	35.10
Feed	52.80	18.40
Concentrate	55.80	12.80
Tailings	36.10	41.40

Table 2. Comparison of Heavy Liquid Tests With Cyclone Pilot Plant Results

	Average of Heavy Liquid Tests			Average of Cyclone Tests		
Product	% Fe	% Sil.	% Wt.	% Fe	% Sil.	% Wt. Calc.
Feed	56.03	13.70	100.00	56.03	13.70	100.00
Conc. (2.97 H.L. Sink)	59.72	8.46	83.58	58.83	10.01	87.58
Rejects (2.97 H.L. Float)	37.17	40.32	16.42	36.26	39.72	12.42

Table 3. Average Results of Medium Loss Tests

	% Sol.	Sp. Gr.	Gpm	% +100M	% Non-Mag. +100M	Sands Medium Loss Lb./Gal.
Concurrent drum, primary	69	2.37	82	18.34	88.19	0.1321
Countercurrent drum, primary	71	2.25	111	16.33	90.25	0.00398
Secondary drum						0.01004*
Primary belt				41.87**	73.62	0.1531
Secondary belt						0.01819

drop the nonmagnetics in the magnetic separator feed. Some of this material becomes mechanically entrapped in the magnetite concentrate and after continuous operation builds up in the circulating medium. This has a twofold effect: (a) it increases the viscosity of the medium, making it more difficult to pump as well as resulting in higher losses of fine iron in the cyclone; and (b) it acts to reduce the medium gravity adversely affecting the efficiency of separation.

5. To offset the buildup of tramp oversize material in the circulating medium, a screen was installed to screen all the magnetic concentrate from the separators before being returned to the thickener. This effectively screened out all material coarser than 20 mesh, but still permitted contamination of the medium by the —20 mesh particles. Continuous cyclone operation under these conditions caused a build-up of these finer particles to a point where the medium became quite viscous, but without too much accompanying loss of gravity. Pumping this viscous material was long a problem.

Because of appreciable amounts of this oversize material on the tramp screen, sprays were installed to reduce the medium attachment to these oversize particles. Even after the installation of three sprays, however, attachment losses still remained higher than were thought to be tolerable. For this reason shallow angle-iron dams were fastened to the screen deck under each spray, which created in effect a small puddling trough. This measure helped considerably in further reducing the attachment losses of medium.

6. Poor feed-control arrangement for the cyclone caused some little difficulty in the pilot plant. The feed-control gate of necessity had to be located in the main washing plant at the sands-discharge point of one of the secondary classifiers and was not easily accessible to the pilot plant operator. In the event of trouble in the pilot plant, necessitating shutting off the feed, the feed control gate had first to be closed before the dewatering classifier and feed conveyor belt could be stopped, resulting in a delay of a minute or more. Whenever the thickener underflow plugged, stopping the flow of thickened medium to the cyclone sump, any subsequent delay in shutting off the ore feed frequently resulted in plugging the cyclone pump. This obviously caused a considerable amount of plant downtime, but was a condition which was particular to this installation and would in all probability not be present in the design of a large-scale plant. It is obvious that controls should be located or the flowsheet designed so that the cyclone plant operator can shut off the feed on a moment's notice. This can be done by installing surge or drain bins ahead of the point of addition of feed to the circuit.

*Feed to secondary drum composed of sands and overflow products from primary drums. **Feed to primary belt composed of approximately 4.5 to 1.0 ratio of +100 mesh material as compared to primary-drum feed.

7. That having a sufficient gallonage of wash or dilution water at several crucial points was vital to good operation became readily apparent soon after the pilot plant was started. These included discharge sumps at the end of the concentrate and reject screens, the movable pan under the reject screen, and the sumps of the tailings discharge and magnetic pumps. Wash water was also essential in the medium return lines and cone discharge underneath the thickener.

8. New medium was added to the circuit by means of a 2½-in. vertical Amsco-Nagle sump pump. It became necessary to install a spray water box, producing a "sizer-action" effect, in the bottom of the sump. This served to keep the new medium being added in suspension, so the pump could pick it up. Without this box, the medium settled to the bottom of the sump and quickly built up to a point where it either plugged the pump or sealed off the suction opening.

The tables presented contain some of the more pertinent data gathered during the season.

Table 1 shows the average analyses of the cyclone feed, concentrates and rejects for all tests made, along with analyses from other individual tests showing representative performances of the cyclone under varying conditions.

The examples cited of individual tests in Table 1 reflect changes in the cyclone through the use of different-sized apex discs; the vor-

Table 4. Structures of Feed and Screen Oversize Shown in Tests on Representative Cyclone Feed

	Screen Feed		Screen Oversize	
		Cum.		Cum.
Screen Size	%Wt.	%Wt.	%Wt.	%Wt.
+ 6M	3.72	3.72	3.96	3.96
+ 8M	9.46	13.18	9.31	13.27
+ 14M	22.98	36.16	22.81	36.08
+ 28M	29.60	65.76	29.68	65.76
+ 35M	16.91	82.67	17.88	83.64
+ 48M	8.69	91.36	9.28	92.92
+ 65M	3.83	95.19	3.66	96.58
+100M	1.85	97.04	1.63	98.21
+150M	0.76	97.80	0.57	98.78
+200M	0.46	98.26	0.30	99.08
−200M	1.74	100.00	0.92	100.00
TOTAL	100.00		100.00	

tex finder remained unchanged. However, one must not go too far in drawing a parallel or making a comparison between the individual tests. The reasons are as follows:

1. Operating gravities were not held constant between individual tests, with variations of several points, that is, from 2.00 to 2.30 in the specific gravity of the float return medium.

2. Marked fluctuations in the character of the feed occurred in one test run to the next. Presence of high-iron middlings or hard paint rock in the feed resulted in high tailings. Feed containing any appreciable amounts of limonitic material usually resulted in higher iron losses in the tails.

3. Because of the fluctuations in the character and grade of the feed, feed rates to the cyclone varied considerably. As the grade of the feed improved, the feed rate, of necessity, had to be decreased to prevent plugging the cyclone discharge.

To determine the efficiency of the cyclone separation, heavy liquid tests were run on several samples of the feed, concentrates and rejects. Average results are summarized in Table 2.

Less Efficient Separation

Examination of the figures in Table 2 reveals that the degree of separation is not as efficient as had been previously reported in some earlier discussions of cyclone operation. This may be due to the following reasons:

1. On the average, separating gravities were not maintained quite as high as those used in the static, heavy-liquid separations on very small samples.

2. Higher viscosity of the medium in the cyclone separation undoubtedly resulted in the loss of some small amounts of fine iron; the almost negligible effect of viscosity in the heavy liquid tests aided in the recovery of this finer iron.

Because of changing day-to-day conditions in the pilot plant, that is, feed rate, character and structure of the feed, and gravity of the medium, the optimum in separating gravities was not maintained at all times. These conditions had no effect in the laboratory heavy-liquid test where separating gravities could be more closely controlled.

It should be added, however, that when cyclone operations are of a more continuous nature and where the character of the feed is not subject to such radical change, conditions governing separation can be more closely controlled and can be made more nearly comparable to those achieved in the laboratory.

Magnetic Separation of Primary Interest

One of the features of primary interest in the pilot plant flowsheet was the test work conducted on the various types of magnetic separators. Two 48-in. belt-type machines were used on the concentrate side and three 36-in. drum-type machines were used on the float side. The belt separators were of the same design, whereas one of the primary drums was constructed to operate as a concurrent machine, and the other as a countercurrent machine. The secondary drum was also a countercurrent machine, but of an earlier design in regard to the box construction. With the exception of medium-loss tests, most of the test work was done on the drum separators to determine the relative merits and weaknesses of the concurrent and countercurrent machines. Little or no comparison based on gathered data can be drawn between the belt- and drum-type separators for cyclone plant use, as the time available did not permit adequate testing of belt-type machines in parallel with drums. However, it can be stated that after making certain small operating changes in the belt machines, peculiar to this particular flowsheet installation, the two standard belt-type machines performed satisfactorily.

In practically all cyclone plants now in the planning or construction stage (or both) on the Mesabi Range, however, there is a decided preference for drum-type machines. With regard to information on the drum separators, the following observations were made, although it should be stated that they were based only on the data gathered during these tests and should not be applied to other drum installations as all-conclusive:

1. The concurrent drum produced a magnetic concentrate at a somewhat higher gravity and at a lower gallonage rate per minute than the countercurrent. (See Table 3.)

2. In most instances, the concurrent drum carried over a slightly greater percentage of +100-mesh tramp material in the magnetic concentrate than did the countercurrent machine. In both machines the percent of magnetics in this tramp oversize was virtually the same. In three tests, the primary belt machine carried over somewhat larger percentages of +100-mesh material than did either drum separator. However, it must be remembered the percentage of +100-mesh material in the feed to the belt machines was much greater than in the feed to the drums.

3. With respect to medium recovery, the countercurrent drum tailings were lower than the concurrent drum machines. Table 3 is a summary of the average of several series of medium-loss tests conducted on these machines.

Nickel Alloy Cuts Wear

It is felt that this discussion would not be complete without some mention being made of the wear on cyclone parts. The model used at the Holman pilot plant was all Ni-Hard, cast in sections for ease of installation. Admittedly, however, it was too heavy and the all Ni-Hard construction was unnecessary. Points of greatest wear were the feed orifice, vortex finder, lower interior of the cone and apex wear disc; these definitely should be cast from Ni-Hard, the remainder can be fabricated from mild steel. It is anticipated that wear discs will last from five to seven days of continuous wear before increase in open area can be tolerated with respect to the separation

desired. One change a season on other parts should suffice, although operation on this installation was not continuous and information in this respect was not conclusive.

Problems Remain

Some problems are still existent in cyclone operation. They bear on feed preparation and recovery of medium among other things:

1. Feed Preparation. Test data on a 6x16-ft. dewatering screen equipped with ¼-mm. cloth opening during the past operating season on representative cyclone feed showed the following:

(a) During a month of test runs, there was no evidence that the cloth was subject to blinding.

(b) The above screen showed that it was able to dewater tonnages of 100 long tons per hour.

(c) Reduction in moisture of predominantly —⅛-in. +65-mesh material gave these results:

	% Free Water	% Non-combined Water
Feed	18.76	22.41
Screen		
Oversize .	11.34	17.70

"Percent free water" is defined as percentage by weight of water removed by spinning for three minutes in centrifuge. "Percent non-combined water" is defined as percentage by weight of water removed by drying for four hours in constant temperature oven at 212 deg. F.

(d) Little loss of +65 mesh material was noted in the screen undersize. Representative structures of feed and screen oversize are shown in Table 4.

This method of dewatering cyclone feed is another approach to the same problem and may prove itself in future operation.

2. Medium Recovery. This is still of pressing concern. Magnetic separator manufacturers are cooperating with the industry in trying to develop improvements on existing machines which will simplify flowsheets. Generally speaking, these problems are divided into three parts:

(a) Recovery of Medium. It goes without saying that excessive losses cannot be tolerated in separating magnetite from non-magnetics. With the machines at hand, this problem is not pressing, although any improvement in recovery of magnetics would be most welcome.

(b) Production of Magnetic Concentrates of Sufficient Purity. If magnetic separator concentrates were not contaminated with tramp nonmagnetics it would not be necessary to install tramp screens where there was little or no natural magnetite in the cyclone feed.

At present, magnetic separators, especially on the float side, are being fed approximately 15 tph of magnetics per foot of width. Feed gallonage does not exceed 100-125 gpm per foot of drum width at 45-50% solids. This is in excess of what had been previously thought of as a normal load, tonnagewise, for magnetic separators in this type of service. There are opinions that the high feed rates are the primary cause of dirty concentrates and that the condition will not be rectified until the feed rates are roughly halved. This would, of course, have the effect of doubling the magnetic separator requirements. Changes in flowsheets could change thinking in this line of thought; but, at this time, it cannot be said that there is universal agreement among operators regarding the loads that magnetic separators can be fed and still deliver a clean concentrate and tail.

It might be stated parenthetically that not enough work has been done to determine how clean the magnetic concentrate must be in this process. There are decided advantages to operating with a clean medium of proper structure but the amount of non-magnetics that can be tolerated in the magnetic concentrate and circulating medium has not been determined. Magnetic separators are probably the most expensive items in the cyclone flowsheet and an effort has been made to keep the number required at a minimum. Capital expense must be reconciled with operating results, however. It is safe to say that magnetic separator requirements, for what is now considered a "standard" flowsheet, will not be decreased, but may be increased.

(c) Production of Magnetic Concentrates of High Gravity. Hand in hand with the problem stated in (b) preceding is the production of high-gravity magnetic concentrates. Assuming production of clean concentrates, it would be highly desirable if magnetite concentrates of sufficiently high gravity could be returned direct to the circulating medium sump, as is practiced in some coal preparation flowsheets. Due to the necessity of screening the magnetic concentrates, and the presence of spray water on the screen, this cannot be seriously contemplated until a clean concentrate can be produced from the magnetic separators. If a flowsheet of this nature is successful, it is reasonably certain that drums offer greater promise as magnetic separators if only for their ability to deliver a concentrate of higher specific gravity.

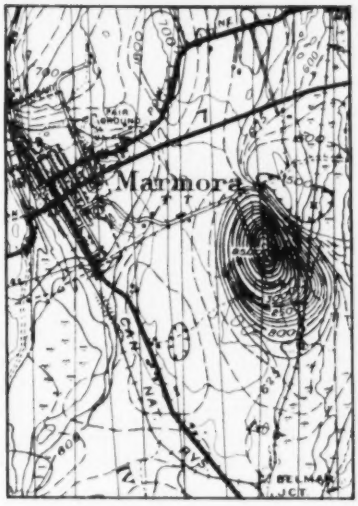
It follows that this problem is closely tied in with removal of water from the cyclone feed. Any improvement in water removal from the cyclone feed would permit a lower gravity of magnetic separator concentrates to be fed to the circulating medium sump, and still maintain the same gravity of circulating medium, assuming satisfactory purity of separator concentrates.

3. Natural magnetite is present to some degree in various horizons of Mesabi Range ores, as has already been mentioned. When ores containing a considerable amount of natural magnetite are encountered, use of tramp screens is mandatory in order to prevent the build-up of coarse magnetite in the circulating medium. The possibility of installing a small grinding circuit to grind naturally-occurring magnetite to the proper structure offers an interesting possibility of providing an autogenous medium where it is indicated by the nature of the crude. To date, no installations of this nature have been made, however.

The Cyclone's Future on the Mesabi

While it is still in its early stages, use of the cyclone separator has obtained a strong foothold in the heavy-density separation of fines on the western Mesabi Range. The Buckeye plant advanced from the status of the first pilot plant tests in 1949 to a full-scale operation in 1951. Work done at the Holman pilot plant has paved the way for two full-scale plants to begin operation in 1953 at the Hill-Trumbull and Hawkins mines of the Mesaba-Cliffs Mining Co. and the Cleveland-Cliffs Iron Co. Cyclone separators are also envisaged in the near future at properties operated by companies other than those mentioned above.

No one on the range admits that the use of the cyclone is the final answer. Although to date it has done a good job in its place, a great deal has yet to be learned about its operating characteristics.



IN 1949, Marmora mine was just a thumbprint on a geomagnetic map.

IN DECEMBER 1952. Four-million tons of stripping completed with 6¾-in. rotary drills, 6-yd. electric shovels, and diesel-powered trucks.

Bethlehem's Marmora Mine Prepares for Production

STRIPPING is now going on at better than a 30,000-ton-a-day rate at the new Marmora open-pit mine, presently under development by Bethlehem Mines Corp., in southeastern Ontario. Plans call for completion of a concentrator in 1954 which is expected to produce some 500,000 tons of 60 to 65% concentrate annually.

Canada takes great pride in this new operation, perhaps in part because the discovery of the blind orebody at Marmora was largely due to a 1,450-sq.-mi. aeromagnetic survey conducted in 1949 by the Geological Survey of Canada, and the Ontario Department of Mines to encourage mineral development in that area. Geomagnetic maps were soon published revealing a number of inviting anomalies—including one that stood out like a thumbprint about a mile east of the town of Marmora. Location of this anomaly was confirmed by a dip-needle survey conducted by the Ontario Department of Mines in 1950.

Bonanza or a Dud?

Now a magnetic anomaly does not always mean that a profitable orebody lies underneath. Some company has to risk appreciable sums to find out whether the anomaly overlies a bonanza or a dud—and here is where Bethlehem stepped into the picture. Encouraged no doubt by discovery of the major orebody at the Grace mine in eastern Pennsylvania by geomagnetic exploration, Bethlehem obtained options on a 290-acre tract on the Rogers and Salmers farms in May 1950.

Diamond drilling started during the following month, and by August, 1951, Bethlehem's staff had completed the campaign. Forty drill-holes ranging in depth from 459 to 1,802 ft. indicated an orebody averaging about 40% Fe, and of sufficient size to warrant an open-pit operation. Thus for the second time in a span of two years, Bethlehem's exploration team distinguished itself by proving up an important buried orebody by application of modern techniques—first at the Grace mine in Pennsylvania, and then at Marmora, Ontario.

Magnetite, the principal ore mineral, is irregularly disseminated throughout a roughly pear-shaped orebody measuring 2,600 ft. along a northeast-southeast axis by a variable width. Ordovician limestone caps the orebody, and this in turn is covered by 15 to 20 ft. of overburden. Boundaries of the orebody are not sharply defined, and therefore must be determined by assay walls. Limestone capping to be removed prior to mining totals about 20-million tons. Something over 10-million tons of waste rock will have to be removed after the ore horizon is reached.

The exploration phase of the Marmora enterprise was followed promptly by development work. Land clearing started in August, 1951. First mining equipment arrived in the spring of 1952. By the end of January 1953, 4.5-million tons of overburden had been removed, and construction of shops and office buildings was 75% complete. A complete line of modern equipment has been provided to accomplish the rugged rock-moving program at a rate of 30,000 tons a day. (See list of equipment used.)

Even at this early stage of development work, the Marmora operating staff has standardized on certain techniques worthy of special mention. For instance drilling speed with the new-type electrically powered rotary drill using roller-cone bits ranges from 22 to 25 ft. per hour including moving and setting-up time. Penetration speeds as high as 40 ft. per hour have been achieved. Details of drill patterns and loading methods are shown in an accompanying illustration. Here the use of millisecond delays has resulted in ideal fragmentation, a minimum of fly rock, and little vibration.

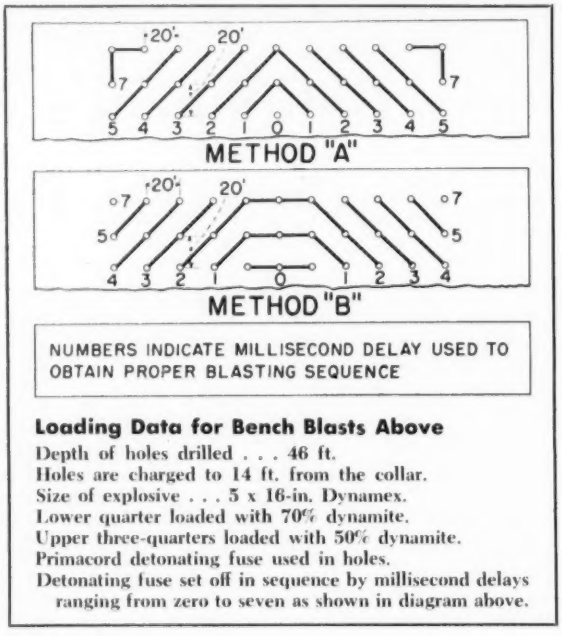
Benches to remove limestone capping are 45 ft. high,

ROADS LIKE "BOULEVARDS" . . . . . .

MAINTAINED WITH CRUSHED ROCK . . . .

DRILLING . . .

Modern electric rotary drills put down 6¾-in. holes at the rate of 22 to 25 ft. per hour including moving time.



Loading Data for Bench Blasts Above

Depth of holes drilled . . . 46 ft.
Holes are charged to 14 ft. from the collar.
Size of explosive . . . 5 x 16-in. Dynamex.
Lower quarter loaded with 70% dynamite.
Upper three-quarters loaded with 50% dynamite.
Primacord detonating fuse used in holes.
Detonating fuse set off in sequence by millisecond delays ranging from zero to seven as shown in diagram above.

LOADING . . .

Holes are drilled on 20-ft. centers according to two patterns shown, and loaded and primed for millisecond blast.

and an overall pit slope of 45 deg. will be maintained. Holes drilled on 20-ft. centers penetrate one foot below the pit floor grade to assure clean break and permit maintenance of a smooth road bed at proper elevation.

Since tire and tube costs constitute an appreciable part of per-ton truck haulage costs at open-pit mines every effort is made at Marmora to maintain smooth roads—"boulevards" is what some of the men up there call them. A diesel-powered crushing plant, consisting of a 22 x 36-in. jaw crusher, conveyor belt and hopper, is spotted in the heart of the haulage area to supply minus 1½-in. crushed stone for the road beds. A rubber-tired bulldozer keeps road clean around the shovels, and occassional small rocks that drop during loading are wisked off the road by the truck spotter who keeps a fork handy for such purposes.

Two other factors responsible for lower haulage costs are (1) modern components installed in the trucks—see "trucks" in the accompanying equipment list, and (2) the systematic training of drivers to establish good driving habits. To achieve the latter, trucks are equipped with continuously-recording sealed tachographs which reveal engine speed in rpm at all times—i.e. tell whether the engine has been speeded excessively, lugged, or stopped. With this critical information drivers are trained to handle the 300-hp. mobile power plants through controls at their finger tips so that the engine will deliver required power with minimum wear on parts. Drivers respond to this training readily because the torque converter is designed to make the driver's job easier, as well as reduce engine, truck, and tire wear.

CUT HAULAGE COSTS FROM PIT TO DUMP.

NEW SHOP WILL MAINTAIN EQUIPMENT.

In a similar way, shovel operators are trained to develop a smooth crowd-swing-dump cycle, and here again, modern devices such as electric controls through Ward-Leonard units prevent shock to shovel parts and overloads on electrical parts. The smaller 2½-yd. diesel-powered utility shovel is equipped with a torque-converter to accomplish the same purpose. New shovel operators recruited at Marmora go through a breaking-in period during which they watch and assist a trained operator, and gradually take over the controls.

A fully-equipped machine and repair shop (see illustration) now nearing completion, is the final link in planned efficient operation of equipment. Here a competent mechanical and electrical staff will work in a series of bays served by overhead cranes. A sufficient number of spare units will be kept on hand to permit the staff to practice real "preventive maintenance."

Future Plans

According to present schedules, a concentrator will be erected to coincide with initial ore output from the mine. Capacity will be about 500,000 tons of concentrates a year, or a daily milling rate of 1500 to 1750 tons. The ore averaging 37 to 40% Fe will be treated to produce a 60 to 65% concentrate. Generally speaking, the flowsheet will involve three-stage crushing, magnetic cobbing, open-circuit rod-mill grinding, followed by closed-circuit ball-mill grinding. The magnetite will be recovered by magnetic separation, and it is felt at present that a grind of 95% minus 100-mesh will be adequate to recover the magnetite readily.

In the open-pit mine, it is estimated that the primary stripping job, involving about 20-million tons of limestone capping will be completed in about two years. After benches have been established in the ore, the trucks will haul to two skips operating in balance on an incline which discharges directly into the primary 48-in. crusher. Capacity of skips and trucks will be about 22 net tons.

Concentrates will be pelletized and shipped by rail to a dock to be constructed at Picton, Ont., and from here the product will go by ship to Bethlehem's Lackawanna, N. Y. steel plant.

The same community cooperation that Bethlehem practices in the U. S. (See *E&MJ*, Jan. 1953, p. 109) prevails in Canada also. A chat with workers and businessmen in the Marmora area will reveal that this attitude is sincerely appreciated. As at the Grace mine, the architecture of mine plant buildings has been selected to avoid unsightliness, and modern homes erected for staff members are designed and landscaped to become a part of the hills, stream and forest.

A number of employees who were not capable of doing strenuous work because of age or physical handicap were employed at Marmora to do important but less strenuous work such as watchmen, etc. This policy has been appreciated. Similarly, the payroll has contributed substantially to prosperity in the area, and this is reflected in the number of new and enlarged well-stocked stores in evidence in a town that saw duller days before the airborne magnetometer favored Marmora as a target for iron ore production.

Mining Equipment

SHOVELS

Three 6-yd. shovels equipped with 2300-v. electric motors—two 45-hp. on the swing; one 45-hp. on the crowd; and one 187-hp. on the hoist. Controls are amplidyne, Ward-Leonard type. Rated at 3,500 tons per 8-hour shovel shift.

One 2½-yd. utility shovel, diesel-powered and equipped with torque converter.

AUXILIARY EQUIPMENT

Three Caterpillar D-8 tractors, one as a spare.

One Tournadozer, used to keep roads smooth at shovel.

TRUCKS

Twenty 14.8-yd. trucks powered with 300-hp. diesel engines. Trucks are equipped with torque converters, semi-automatic transmissions, gear selector (1, 2, 3, reverse, slow, second, high) thermostatically-controlled radiators, hydraulic assist steering, air-assist on emergency brakes, single-lever control to dump and lower box; rock ejectors on dual tires.

Exhaust gases of the engines are conducted to double bottoms and side of the truck boxes to heat the boxes.

Four diesel-powered 6-yd. dump trucks for auxiliary service.

DRILLS

Two electrically-powered rotary drills equipped with 6¾-in. rotary bits, and cyclone type dust collectors.

Four wagon drills for secondary drilling, fitted with 4-in. drills. Steel 1¼-in. round lugged in 9-ft. changes. Single-pass bits with 2½-in. starters.

Five hand-drills with single-pass bits for boulder popping.

OTHERS

One roadgrader, 22x36-in. jaw crusher for road building, two air pumps, two 300-cfm compressors, one 500-cfm compressor.

J. W. HILL (left) general superintendent of U.S. Vanadium Co. presents company's Merit for Safety Achievement certificates to safety engineers. A. M. Simpson at Rifle plant, and T. R. van Fleet at Uravan.

USV's All-Out Safety Drive Pays Off at Uranium Mills

T. R. VAN FLEET and A. M. SIMPSON,
Safety Engineers at U. S. Vanadium Co.'s
Rifle and Uravan, Colo., Mills

IN MID-1950 the management of United States Vanadium Co. started a stepped-up safety program at the company's two vanadium-uranium mills at Uravan and Rifle, Colo. This move paralleled an increased production program during which many untrained employees were hired. One year later, in 1951, beneficial results of the program were clearly obvious. The accident frequency rate (number of accidents reported per 1-million man-hours) at the Rifle plant dropped 91.6% under the average for the three preceding years, and at the Uravan plant 75.7%.

Prior to the new safety program, the safety experience at these plants was not out of line with the national average, but for Union Carbide and Carbon Co., the parent company of USV, national standards are not enough, and the Colorado operations strove to achieve the higher-than-average record of other Union Carbide plants.

In recognition of their splendid record, the two Colorado plants received the Safety Achievement Award presented by Union Carbide to its plants with outstanding safety records. Individual safety awards were presented to each employee of USV in Colorado, along with safety certificates issued by top officials of USV in New York.

The first step in the program was to employ a full-time safety engineer at each plant. These safety engineers were taken directly from the production staffs, and each had a full knowledge of the plant's operations.

Since most accidents result from unsafe acts, and not from unsafe conditions, the management launched a safety educational program. At the same time steps were taken to make all necessary physical plant improvements. All supervisory employees were asked to examine their departments and recommend corrections for potential hazards. Then a rotating safety committee was appointed to determine which improvements were most urgent, and work on these was started immediately. A new list was submitted each month; completed recommendations were acknowledged, and new suggestions added.

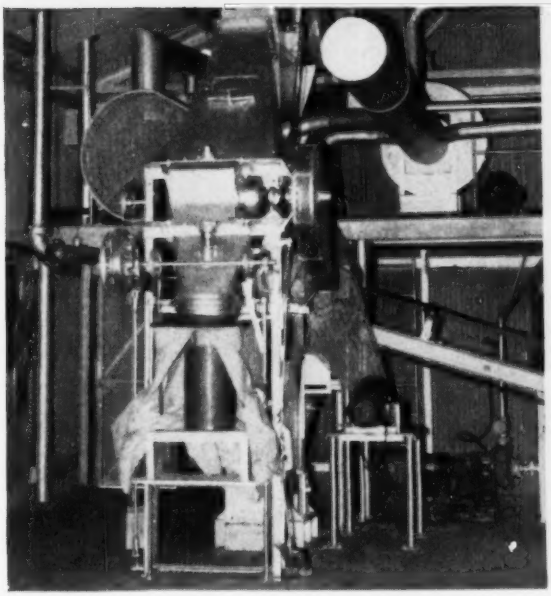
Physical Improvements

As a result of this system, metal guards were placed on all belt drives, and head and tail pulleys. Metal grating stairways and walkways replaced most wooden ones; and where possible, ladders were replaced by stairways. Dust collectors were installed where necessary, and sanitary lockers, lunch rooms, and wash rooms provided.

In all new plant expansion, the safety engineer checks the construction plans to see that they comply with the new high plant standards.

Selling Safety

To sell safety to employees, workers participate in safety contests, and monthly safety meetings. They serve on committees, and make frequent suggestions. Special sessions



DUST COLLECTORS, metal guards on drive wheels, metal gratings on walkways were installed to eliminate all possible hazards existing in the plant.

PLANT EMPLOYEES are protected with respirators, goggles, gloves, safety shoes, prescription glasses as part of the all-out program at the uranium plants.

are held for foremen to teach them better safety practice. Each new employee spends sufficient time with the safety engineer to review general safety practice, become acquainted with the safety booklet, and make a plant tour. Plant bulletin boards carry special safety messages. Safety films are shown to employees after working hours, but on time paid for by the company.

The plant safety committee meets monthly with representatives of the local union to review safety rules, and discuss further plans to safeguard employees. Pamphlets on various phases of safety are distributed.

Personal Protection

Protective equipment in use was carefully checked by safety directors, and new types were investigated. Effective respirators were selected to meet conditions encountered in the plant. Safety glasses were also made available at no expense to the men. Those who required lens correction received the benefit of the company's quantity discount. Currently, 80% of the men who need corrective glasses are wearing them. Employees are also encouraged to buy and wear safety shoes, which they can obtain through the company at cost. Now 85% of the employees wear them. Safety goggles, gloves, and shoes have been furnished to employees who work near acid solutions.

New centrally located first-aid rooms were set up at each plant. Records are kept of all injuries requiring treatment, and if the injury is at all serious, it is referred to the plant doctor immediately. The foreman directly in charge of an injured man is required to fill out a report on each accident. This means that the foreman has to know where and how the accident happened, and thereby take steps to prevent its recurrence.

A. M. SIMPSON points out safety tags and padlocks on electrical switches.

Fire protection and prevention was a problem tackled early by the Uravan and Rifle safety departments. Fire fighting equipment in the form of fire trucks, extinguishers, hoses, and alarms, was provided. Fire-fighting brigades were set up so that a crew would be available on each of the three shifts of mill production.

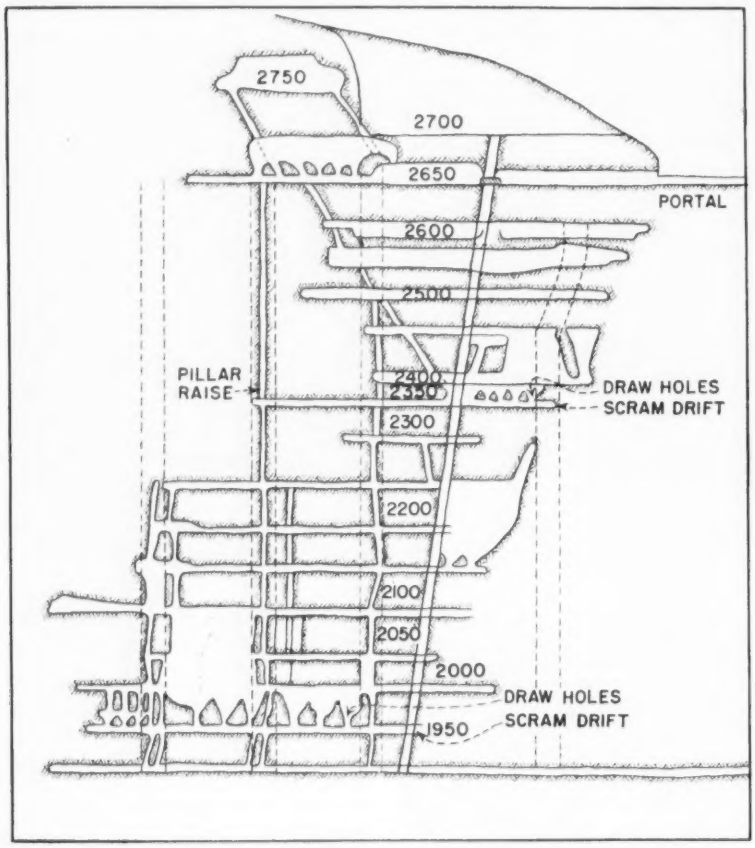
Since many more accidents occur in the home and outside working hours, than on the job, the company has extended its safety drive to cover home safety. Fire prevention, general home accidents, and the housewives' role in home safety was discussed before the local PTA group. Motion pictures were shown, and a home-safety contest organized which offered prizes to winners.

At the Uravan plant, where practically all of the housing facilities have been furnished by the company, special care has been given to butane installations, home gas appliances, electric wiring, and flues. All danger spots such as ditches, cliffs, and highways have been fenced off. Red Cross home nursing and first-aid courses have been presented.

The work in safety accomplished by the U.S. Vanadium Co. at Rifle and Uravan is a graphic example of what can be attained by an "all-out" safety effort on the part of the company and its employees.

By doing all in its power to protect and educate its employees, the company has seen the safety idea take hold in the minds of its employees at home and at work, and has also had the satisfaction of seeing its accident rate sharply decline. At USV "Safety is an important enterprise!"

KEEPING TAB ON PRACTICE



ALL WORKINGS ARE ABOVE THE 1900 LEVEL, which is also known as the river tunnel, in the Reeves orebody, as shown in this section.

Costs Cut by Change to Sublevel Long-Hole Benching

JOHN B. HUTTL
Associate Editor
San Francisco

A MATERIAL DECREASE in operating costs since vertical slicing by sublevel long-hole benching was adapted to mining the low-grade, lead-zinc Reeves orebody, is reported at the Reeves MacDonald property in British Columbia by the operating Pend Oreille M. & M. Co. This method replaced the removable horizontal-pillar and horizontal-open-stope mining with slushers (*E&MJ*, July, 1949, p. 103) practiced during the first year of operation. Output currently runs over 1,000 tons per day.

The Reeves orebody is a replacement in limestone. The beds strike east-west, dip south at 57 deg. The ore zone proper follows the same strike and dip, and is lens-shaped in plan. It is about 400 ft. long and has a maximum width of 80 ft. At one end the lens splits into two sections, each about 500 ft. long and averaging 15 ft. wide. The ore in this area is more erratic and of lower grade than the main orebody. Ore limits can be projected with remarkable accuracy from level to level, and the ore rock, hanging and footwalls are strong and stand well, lending themselves ideally to sublevel stoping with long holes. A cross section of the orebody is given. It shows that all workings are above the 1,900-ft. level and that stoping has been confined to the main orebody.

The 1,900-ft. level and the 2,650-ft. level are connected by a service raise and an ore pass about 30 ft. in the footwall. Levels have been opened at 50-ft. intervals. To get tonnage for the first 500-ton mill unit while development was progressing, the levels below the 2,650 were slashed the full width of the ore and the broken material slushed to the main ore pass. After this was done to slushing limits breasting down was started by taking 10 ft. out of the back, followed by starting a 10-ft. bench. In both cases the broken material had to be slushed to the main pass. This produced large boulders, so that secondary blasting increased.

Why the Change?

Conditions influencing the change to the new method include:

1. Firmness of ore and country rock.
2. Remarkable continuity of ore over vertical range.
3. System permits breaking more ore than is drawn, permitting storage of large tonnage of broken material.
4. Slushing is required only to remove broken material from sublevel drift.
5. A larger tonnage is broken per foot of drill hole.

Development required prior to long-hole stoping consists of a slusher or scram drift, sublevel drifts at 50-ft. intervals, and slot raises connecting sublevels for initial break between pillar sections. Two main scram levels have been opened at the 1,950 and 2,350 levels. Scram drifts are driven 8x8 ft. with draw points cut at 25-ft. centers. Sublevel drifts are driven 5 x 7 ft. through the center of the orebody. To provide ore passes from the upper scram and facilitate driving sublevels, 30-ft. pillars are left from hanging to footwall at the 140-ft. centers. A raise is driven along the footwall in each pillar section and connected to the sublevels by a short raise out of the hanging-wall or pillar raise.

Stoping Starts at Slot Raise

A typical stope section is 110 ft. long, 50 to 80 ft. wide, and 50 ft. thick. Stoping on each level starts at either end of the orebody and retreats toward the shaft crosscut. A stope section is opened by slashing a 10-ft. bench around the top of the slot raise. The bench is then drilled with down holes paralleling the raise, and spaced 2 to 2½ ft. apart. In this way the slot is enlarged until hanging and footwalls are reached. The stope then retreats toward the shaft in 10-ft. slices the width of the orebody. Each slice consists of a slash 10 ft. wide and 9 ft. high from drift to hanging wall and footwall. The resulting bench is drilled with two parallel rows of down holes spaced 7 ft. apart with a 5-ft. burden on the rows. All holes are drilled at the prevailing dip of the walls, and in most cases are drilled through from 55 to 60 ft.

After the long-hole bench round has been blasted, a new 10-ft. slash is drilled and blasted from hanging wall to footwall, followed by drilling long holes. This is repeated until mining has retreated to the next pillar. Holes are loaded to within 3 ft. of the collar with 1¾ x 16-in. 40% Forcite and detonated with millisecond delays. The ore is not too abrasive, and carbide bits have shown little gage loss. Drilling the holes parallel distributes the burden better, gives better fragmentation and lower powder consumption per ton broken than by fanning the holes from a sublevel drift.

Power-Feed 3½-in. Drifters on Aluminum Shells

Drills used in long-hole drilling are 3½-in. Gardner-Denver automatic drifters mounted on 7-ft. aluminum shells. Two bars with a 14-ft. arm between them are mounted parallel to the edge of the bench, and a row of holes drilled on each side using a 3-ft. cross arm. All holes are drilled with 2-in. Timken or Carset carbide bits. The rods are 5 ft. long, made from 1-in. QO carbon steel, and threaded for C.I.R. type 1 couplings. Lugged shanks are made up from 2-ft. lengths of 1¼-in. round steel with the holes in the shank end plugged. A hole is drilled in from the side for use with a water swivel. Average bit life is 350 to 400 ft., bits being sharpened after each hole. Average rod life and coupling life are 75 ft. and 100 ft. of hole respectively. Rods and couplings are reversed in consecutive holes to keep thread wear even.

Tonnage, including opening the initial slot, averages 2.5 tons per ft. of hole drilled. A 2-man crew averages 400 tons per machine shift. Slusher tonnage varies from 40 to 50 tons per machine shift, reducing the overall average to about 170 tons per machine shift.

Scraper assemblies used in the scram drifts for moving broken ore from draw points to the ore pass consist of 30-hp. electric slushers with 36-in. scrapers, and 50-hp. electric slushers with 60-in. scrapers. Tonnage moved per man shift with the 30-hp. unit averages 90, and that with the 50-hp. unit 400. Scraping distance averages 100 ft.

Tractor Replaces Slusher

An International TD-14 diesel-powered tractor with 'dozer blade has been used on the 2,650 level in place of a slusher for moving broken ore from draw points to ore pass. Distance is about 150 ft. Material moved per man shift averaged 425 tons. This unit was also used in an open pit for moving broken material 200 ft. from a bench to the ore pass, handling about 420 tons per man shift. Counting miners and the tractor operator, an average of 140 tons per man was made. Slushers and track-mounted equipment are limited to the distance that ore or waste can be moved economically.

Cost of long-hole drilling averages 43c. per ft. This includes drilling labor, 30c.; rods and couplings, 8c.; and bits, 5c.

Benching Cost 31¢. Ton

Total cost of benching is about 31c. per ton. Slashing benches prior to long-hole drilling averages $1.10 per ton. As the ratio of slash material to long hole is about 1 to 4.5, the overall stoping cost is 45.5c. per ton. Some experimental work has been done with diamond-drill blastholes as ring drilling from sublevel drifts and from benches, but results compared unfavorably with those attained with carbide bits and percussion drills.

This information is presented through the courtesy of W. L. Zeigler, general manager, and L. M. Kinney, general superintendent.

Rotary Drilling Also Scores New Gains

DESIGN OF A ROTARY DRILL for the softer rock formation has been brought to the final stage by Chicago Pneumatic Tool Co. The machine is designated the CP-555 Rotauger. Essentially, it consists of a 12.5-hp. rotary motor geared down to required auger speed. A feed motor, within the same housing but independently controlled, is geared to revolve a feed nut about a fixed feed screw, which is part of a conventional-type shell mounting as used on drifter drills.

The new drill is shown above in a drift in Cleveland-Cliffs' Mather mine "A" shaft workings at Ishpeming, Mich. Much of the drilling in this mine is done with the CP rotary drills which preceded the new machine. See *E&MJ*, Feb., 1953, p. 116.

Better Communications for Bigger Tonnage

A BETTER SYSTEM of communication underground was found to be necessary in a Tennessee zinc mine if increased production was to be realized. With the aid of a manufacturer specializing in electronic communication and control the following system was worked out:

A wired audio system was installed providing microphone - loud - speaker stations between surface shop, levels at two shafts, and the top and bottom of four inclines about 800 ft. long. Altogether, about two miles of two-pair cable is used in the audio system, there being 12 stations on a 60-watt amplifier.

Two diesel locomotives are used for

haulage, one on each level, and Mancha trammers for gathering. Femco F.M. plug-in units were installed on the diesels and one on a Mancha. The diesel unit operates from a 6-volt automotive battery, being charged by a generator. The Mancha unit operates from the 40-volt battery by means of a Vibrapack self-contained in the unit. A loop antenna is used on the locomotive and this couples to a No. 14 insulated copper wire strung on insulators along the top or upper rib of the drift. After the F.M. installation was complete, a coupling unit was provided to make the audio and F.M. systems talk as one common circuit.

Advantages were realized in better supervision, distribution of empties, reduction of time wasted and speeding of repairs.

Track Cleaner Proves Useful, Taking 3-Man Crew

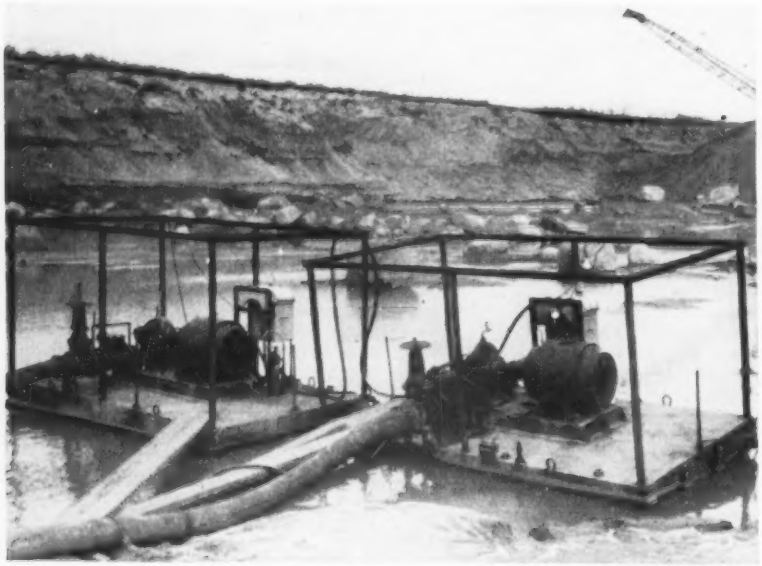
IN CLEANING DRIFTS and crosscuts at Cleveland-Cliffs' Mather "A" workings, a Canton track cleaner, made by American Mine Door Co., is pulled by a mine locomotive through the passage to be cleaned, according to G. A. Dawe, who has prepared this description. The track cleaner has an adjustable digging plate that loosens material between the rails down to the level elevation. It also has wing plows and plow extension that push spillage and other material from outside the rails onto the track center and into the path of a feeder conveyor. These plows can be adjusted independently, both up and down and sideways, to compensate for conditions in the drift. In this manner the drift can be cleaned over its full width and down to tie elevation.

The feeder conveyor is over and ahead of the digger plate. It moves material between the tracks over the plate and onto a boom conveyor, which carries it upward and backward to a point where it drops into a 6-ton low-head car.

As used at present, both feeder and boom conveyor are powered by 3-hp. ac gear-type motors. Thought is being given to replacing these ac motors with 86 144-v., dc units, to make it possible to drive the conveyors with motors that take current from a battery-type locomotive or a combination battery-trolley unit.

Time studies indicate that under ideal conditions the actual loading time would be less than 10 minutes for a 6-ton car. The cleaner has been used under varying conditions, the consistency of the material cleaned ranging from dry and packed to wet and very sticky. Conditions for using the cleaner will be ideal after all drifts and crosscuts have been thoroughly cleaned the first time. Poles and other obstructions buried in the mud should be removed by then.

Experience in the "A" shaft workings indicates that the track cleaner will clean upwards of 300 ft. of drift in an average eight-hour shift, loading from 40 to 50 tons of material. Track cleaning currently requires a three-man crew.



TWO 2,500-GPM F-M CENTRIFUGALS at the Morton mine pump water through 8-in. lines which join in a 16-in. line that carries water out of drainage area. As many as six pumps have been on the job at one time handling a peak volume of 21,600,000 gal. per day.

Drainage of Morton Pit a Big Job

TO WORK THE MORTON iron mine, at Hibbing, on the Mesabi, as an open pit, the M. A. Hanna Co. was confronted with the task of removing overburden of an average depth of 190 ft. and a maximum depth of 240 ft. The Bucyrus-Erie, 1150-B, 30-yd. dragline, which had stripped the deep overburden on the South Agnew property nearby, was transferred to the Morton with its portable screening plant and conveyor system for transporting the overburden to the dump.

When stripping started in 1950, water was found within 5 ft. of the surface. Large-scale pumping was in order. Three 1,500-gpm deep well pumps were installed in an old concrete shaft, and a drainage cut was put in along the south side of the area. This ditch was 60 ft. deep, 200 wide and 1,500 long and deepened into a sump at one end. Pumps were mounted on floats, at first sump pumps and later centrifugal pumps. As the work progressed additional sumps were dug and more pumps installed. As many as three sumps have been used at one time and, at peak periods, six pumps.

As reported by a Fairbanks-Morse representative, there were two floats side by side in a single sump. On each was mounted an 8-in. Fig. 5814 F-M horizontal centrifugal pump with rated capacity of 2,500 gpm at 300-ft. head. These pumps have 3A iron heat-treated parts. Each is driven directly by a 250-hp., 1800-rpm. Model QZK F-M induction motor. The two 8-in. discharge lines from the two pumps joined in a 16-in. line which carried the water over the hill. Work was in progress on a 20-in. line to take the water 6,500 ft. to a swampy area. These two pumps were adequate to keep surface water down but much greater volume was needed to drop water level below the ore formation.

Work was being completed on a new float which carried two 5-in. Fig. 5912 F-M centrifugal pumps rated at 1,000 gpm at 300-ft. head.

On hand and ready for installation is the biggest pump assigned to the Morton project, a Fairbanks-Morse Pomona deep-well turbine pump with capacity of 3,500 gpm at 350-ft head. This will be installed in the original shaft where an 1,800-gpm turbine pump is already in service.

PROSPERITY IN THE USA: How Deeply in Debt Are We?

How prosperous *are* the people of the United States? Previous messages in this special series have answered this question in part by recording the progress – relatively slow progress – we have made in increasing both the income and the wealth per person in the USA.

This fourth and concluding piece of the special series deals with the extent to which our prosperity should be discounted because it has been accompanied by an increasing volume of debt. Many correspondents have suggested to us that an individual or a nation can temporarily increase prosperity by borrowing, but in so doing lives on both borrowed goods and borrowed time. Our purpose here is solely to throw light on the question of whether or not we are now in that unenviable position.

On January 1, 1953, the total debt of the United States government and of its citizens was $627 billion, as shown in the table below. On its face, a debt of this magnitude, which represents about $3,900 of debt for each person, suggests that we are heavily debt-ridden.

TOTAL DEBT – PUBLIC AND PRIVATE

Federal government debt	$267 billion
State and local debt	30 "
Private debt	
Corporations	195 "
Individuals	135 "
	$627 billion

The burden of our debts, however, does not depend simply on their size. It depends in much more decisive degree on our capacity to carry the load successfully. This capacity, in turn, is partly a matter of attitude, and attitudes defy objective measurement. A community that gets very jittery about its debts has less capacity to carry its burden successfully than one that does not. But the accurate measurement of jitters, present or prospective, still remains to be mastered.

Capacity to Carry the Debt Load

Nonetheless, it is possible to throw some light on our capacity to carry the debt burden by studying key economic elements that can be measured with some degree of accuracy. The following paragraphs indicate how some of these key economic elements stand.

Compared with our national income, the total volume of our debts, public and private, is still well below the level of 1929, when it proved to be too big for the good of the country. Our total debt is now 113% greater than the national income whereas in 1929 it was 146% greater.

There are several other cheering facts about our debts. One is a sharp decline in interest rates which makes the cost of carrying our debts relatively much less than it was in 1929. It took 8% of our total national income to carry our debts in 1929; it takes only about 5% of the income today.

More Cheering Facts

We also have much more ready cash now than in 1929. Today individuals and corporations hold a total of $269 billion in cash or its equivalent which is almost twice as much as the portion of private short-term debt (about $140 billion) that is subject to sudden demand for payment.

Many students of the subject cite the relatively low cost of carrying our debts and the large volume of cash on hand, and reach the comfortable conclusion that our debt burden is nothing to worry about. In further support of this view they emphasize the fact that no important part of our debt is owed abroad. Hence, they reason there is not the danger, so conspicuous in Britain since the end of World War II, that our economy will be upset by the necessity of making heavy debt payments to other countries.

Some Dangers of Present Debt

However, the nature of our debts presents dangers that it would be foolish to ignore. This is true of both the debt of $267 billion owed by the federal government to its citizens and the $330 billion in private debts owed by some citizens and corporations to others.

Public debt can be a dangerous kind of debt because government has the power to print money or to create its equivalent by expanding bank credit. Of the $215 billion that the federal government borrowed during World War II, over $90 billion was borrowed from banks. This was the largest single contributor to the inflation of prices that since the war has robbed the dollar of about half of its purchasing power, and thereby robbed the buyers of government bonds of about half the purchasing power these bonds were supposed to represent.

If, as is quite possible, a new emergency should again require the federal government to borrow heavily while its debt remains so high, it is doubtful that the public would be avid to buy its bonds. Hence, the government might again be forced to resort to the inflationary process of relying on bank credit.

Private debts can be dangerous if the people take on new debts more rapidly than is justified by the growth of business or by their ability to repay. Last year bank loans were increased by the imposing sum of about $6½ billion, which represents an increase of about 11% in total loans outstanding. This is almost twice as much as the increase in the volume of business over the same period. Installment credit for consumers increased by $3 billion last year, again an increase in debt about twice as great as the increase in business volume in the fields where the credit was used. It is also the fastest rate of such growth in our history.

Constructive Use of Credit

So long as the expansion of credit does no more than keep pace with expansion in the volume of business, the expansion is constructive. Also, when credit is expanded to acquire resources and equipment that will enlarge the volume of business a little later, that use is clearly constructive. But when private credit expansion begins to run ahead of business growth, it is time for us to be heads up. Such credit expansion courts price inflation. It also creates a forced draft under business so that, if credit is cut off, there may be a painful drop.

To give a summary answer to the question: *Is the level of debt in the United States a danger to our prosperity?* — the answer seems to be, "Not at the moment." We owe nothing abroad. The interest burden on present debt is relatively small, and we appear to have the resources to handle the short-term debt. Yet both the total amount of debt and the recent rapid increase in total private debt, especially the latter, are enough to signal for caution. We need restraint on the part of business and consumers to avoid expanding private borrowing at an excessive rate. The federal debt needs to be reduced and put in more manageable form. If these things are done, we can proceed to build a sound prosperity.

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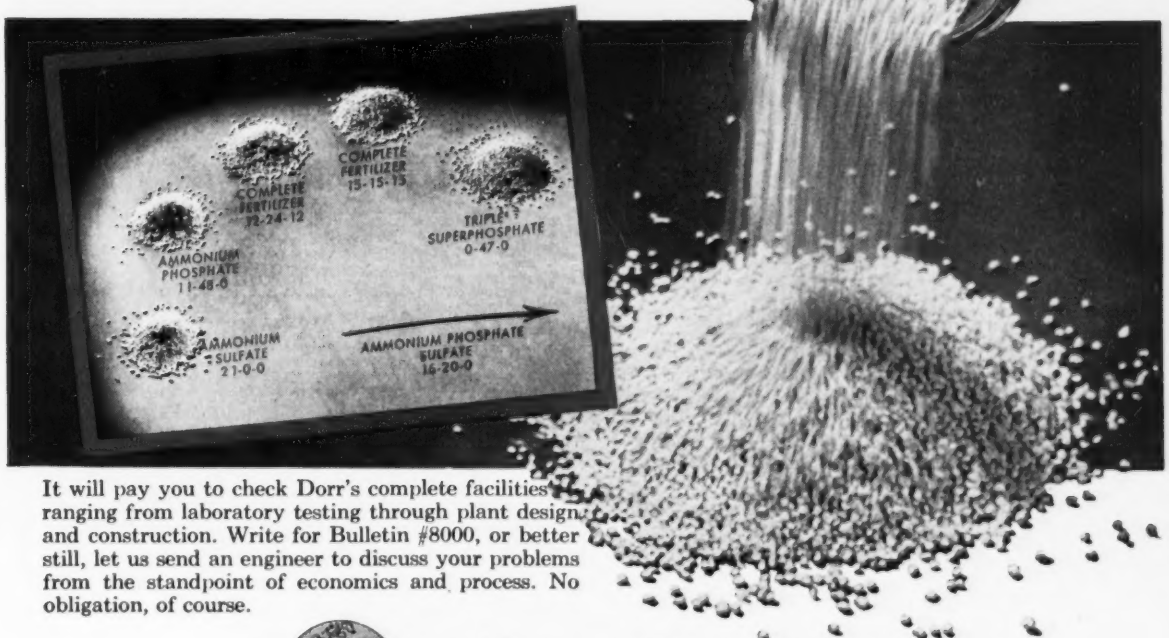

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 (*Continued from page 69*)

Bauxite Supply Increased During 1952

Preliminary figures issued by the Bureau of Mines indicate that total new supply of bauxite in 1952 was 5,260,041 long tons, against 4,678,605 tons in 1951. The increase resulted from larger imports with Jamaica a factor for the first time as a source of supply. Expanded facilities in Surinam resulted in receipts from that area of 3,035,272 tons.

Though domestic production of bauxite increased substantially in the fourth quarter, total output in this country in 1952 was 5% below that of the preceding year. Approximately 96% of the annual domestic production was mined in Arkansas. Only one-third of the new supply of bauxite came from domestic sources in 1952.

Production and imports of bauxite during the last five years, in long tons, are shown below:

	Mine Production (a)				
Year:	Arkansas	Alabama and Georgia	Total United States	General Imports (as shipped)	Total New Supply
1948	1,395,341	61,807	1,457,148	2,488,915	3,946,063
1949	1,094,924	53,868	1,148,792	2,688,164	3,836,956
1950	1,307,335	27,192	1,334,527	2,508,970	3,843,497
1951	1,815,274	33,402	1,848,676	2,829,929	4,678,605
1052 (b)	1,688,668	63,177	1,751,845	3,508,196	5,260,041

(a) Dried equivalent. (b) Preliminary figures.

Mercury Output Rising

Salient statistics of mercury, in flasks of 76 lb., according to the Bureau of Mines:

	1951	1952
U. S. production	7,293	12,500
General imports	44,925	68,686
Exports	241	400
Consumption	56,848	43,000
Stocks at end:		
Consumers-dealers	29,100	32,500
Producers	1,072	635
Average price	$210.13	$199.10

General imports of mercury in 1951 and 1952, in flasks of 76 lb.:

From	1951	1952
Bolivia	19	...
Canada	660	20
French Morocco	...	50
Germany	250	...
Honduras	10	...
Italy	17,633	26,026
Japan	250	...
Mexico	4,988	7,971
Netherlands	...	100
Spain	13,608	24,332
Sweden	780	...
Switzerland	204	...
Yugoslavia	6,523	10,187
Totals	44,925	68,686

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

March 31, 1953

Aluminum ingot, 99 plus percent, lb. (effective Jan. 22)	20½c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	37.97c.
Bismuth, ton lots, lb	$2.25
Cadmium, commercial sticks, delivered, lb	$2.00
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb.	$2.40
Germanium, lb	$340.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	60c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	27c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$200 @ $203
Selenium, 99.5 percent, lb.	$4.25 @ $4.75
Silicon, minimum 97 percent, carloads, lb.	20c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 plus, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per unit	$46.00 @ $48.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $32.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $56.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$10.10
Mesabi bessemer	$9.85
Mesabi, non-bessemer	$9.70
Lead (Galena), 80 percent, Joplin, Mo., ton	$166.50
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.18 @ $1.21 c.i.f. U.S. ports, duty extra. Long-term contract nominal at 90c. to 93c., c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb.	$2.50 @ $3.00
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, f.o.b. foreign ports	$40.00 @ $41.00
Domestic, scheelite, 60 percent f.o.b. mill	$63.00 @ 65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$65.00

(a) F.o.b. port of shipment.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½c.
Cobalt Oxide, 72½ to 73½%, ceramic grade, per lb.	$1.82 @ $1.84½
Copper Sulphate, 100 lb.	$10.85
Germanium Oxide, lb.	$142.00

ALLOYS

Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$225
Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$4.85
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, per lb. contracts	11.4c.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$85.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or Shorts	$34.00 @ $63.00
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$10.15 @ $10.40
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective ton	$43.00
60% effective CaF_2	$37 @ $40
Acid 97% concentrate, bulk, ton	$60.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$39.56
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton Scrap $32 and up.	
Ocher, Georgia, ton, in sacks	$26.25
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$25.50 @ $27.50
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$54.50
Steel, f.o.b., Pittsburgh billets, net ton	$59.00
Structural shapes, 100 lb.	$3.85

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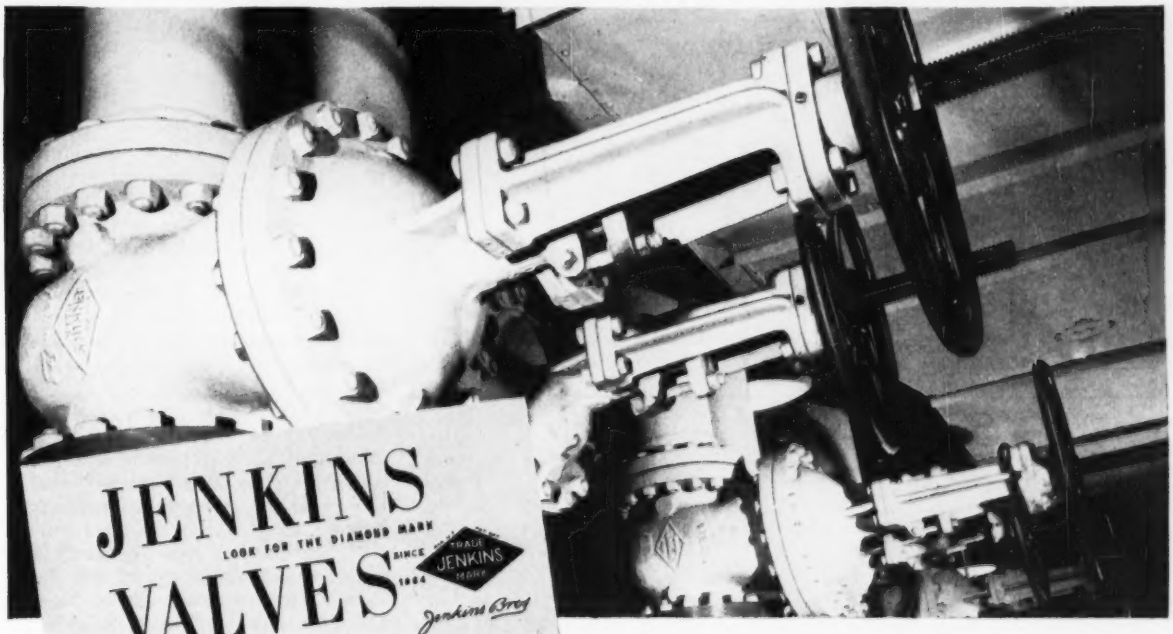

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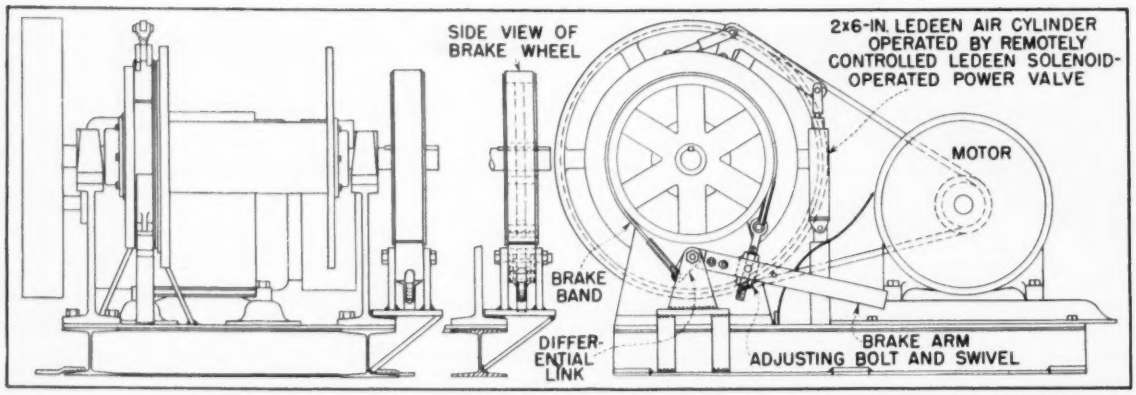
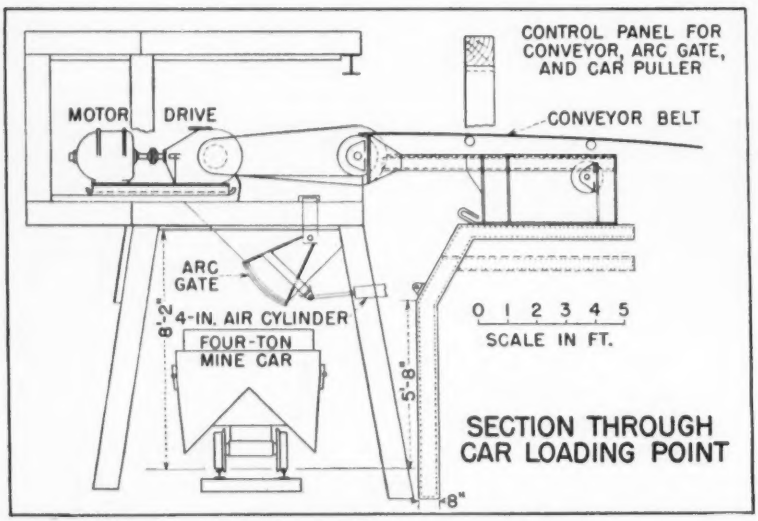
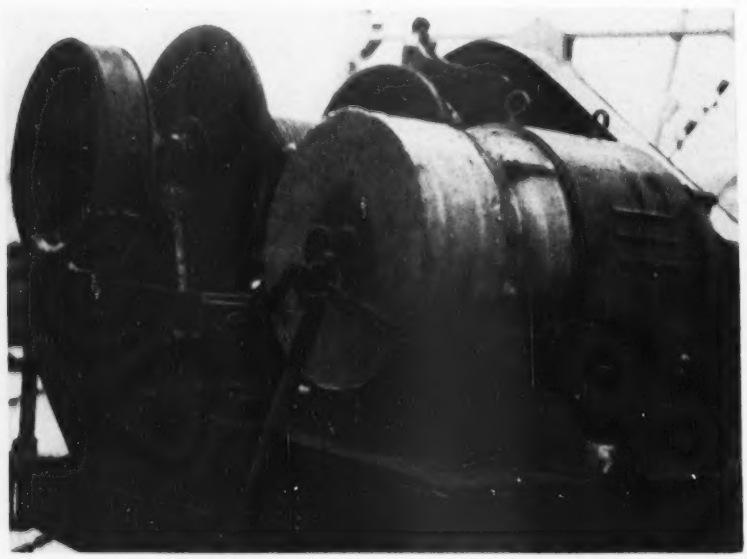

SIDE VIEW OF BRAKE WHEEL
2x6-IN. LEDEEN AIR CYLINDER OPERATED BY REMOTELY CONTROLLED LEDEEN SOLENOID-OPERATED POWER VALVE
MOTOR
BRAKE BAND
DIFFER-ENTIAL LINK
BRAKE ARM ADJUSTING BOLT AND SWIVEL





REMOTE-CONTROLLED HOIST for car puller is electrically powered.

Miami Car Puller Improves Loading Operations

THE CAR PULLER shown here is used at the Miami Copper Co. operations in Arizona. It was designed by J. B. Fletcher, chief mine engineer, and built in the company machine shop under the direction of A. L. Thomas, machine shop foreman.

Mine cars used at Miami are 4-ton gable-bottom cars with a link-and-pin coupling. A train is made up of 30 cars. Grade of the track is 0.3%.

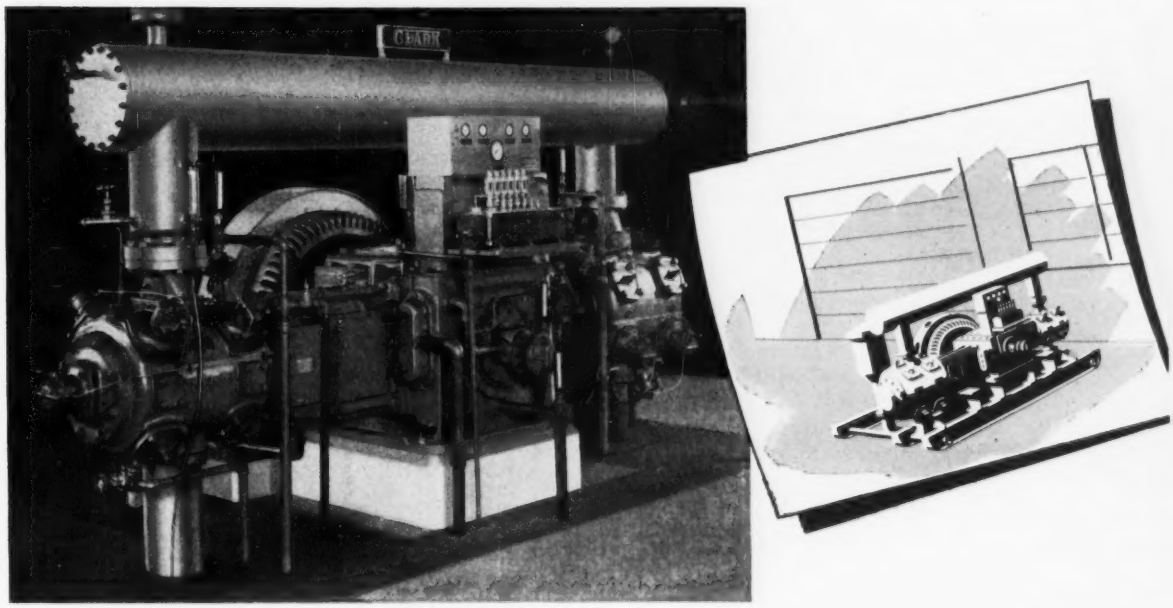
With commercial type car pullers, momentum of the cars intended to take up all slack in the link-and-pin couplings when the train was pulled into place and stopped. The rollback became accumulative, and the ratchet hold-back failed. Therefore a differential brake hold-back was designed for the model shown here, and this has worked very satisfactorily. Furthermore the fly-wheel effect of the drum and sheave wheel on the Miami car puller kept the train taut at all times.

Cars are loaded from chutes and belt conveyors. The chute door is operated by an air cylinder as illustrated. One man controls the chute door, the car puller, and the conveyor from the operating position beside the head pulley of the conveyor belt.

Here's how the system works: An empty train is backed into line by a gathering locomotive. The conveyor operator connects the car-

Need to replace a compressor?

HERE'S HOW TO AVOID PRODUCTION LOSSES DURING CHANGEOVER



Clark 150 hp, CMA-2 Balanced/Opposed Motor Driven Compressor in a Pennsylvania metal forging shop.

Normally, replacing an old or inadequate compressor involves either serious losses in plant air capacity during changeover, or requires a building addition to house the new unit. Such dislocation and unnecessary expense can be avoided with a Clark Balanced/Opposed Compressor.

Because of perfect balance and overhung rotor construction, it's a simple matter to mount an average size Clark unit on a steel skid and operate it outside of the compressor building, while the old unit is being torn down and the foundation is completed for the new one. When ready to change over, the new unit is easily taken inside — skid and all — bolted down to the new foundation and tied into the existing piping facilities. *A weekend is usually enough for the job!*

Furthermore, the compact design of the Clark Balanced/Opposed Compressor enables doubling — *even tripling* — air capacity, using the same floor area occupied by outmoded, inadequate compressors.

For air compressors within the 150-4500 hp range, write for Bulletin 118 or see your nearest Clark representative.

CLARK BROS. CO., OLEAN, N. Y.
Division of Dresser Operations, Inc.
Sales Offices in Principal Cities Throughout the World

PRECISION BY THE TON

CLARK

balanced/opposed compressors

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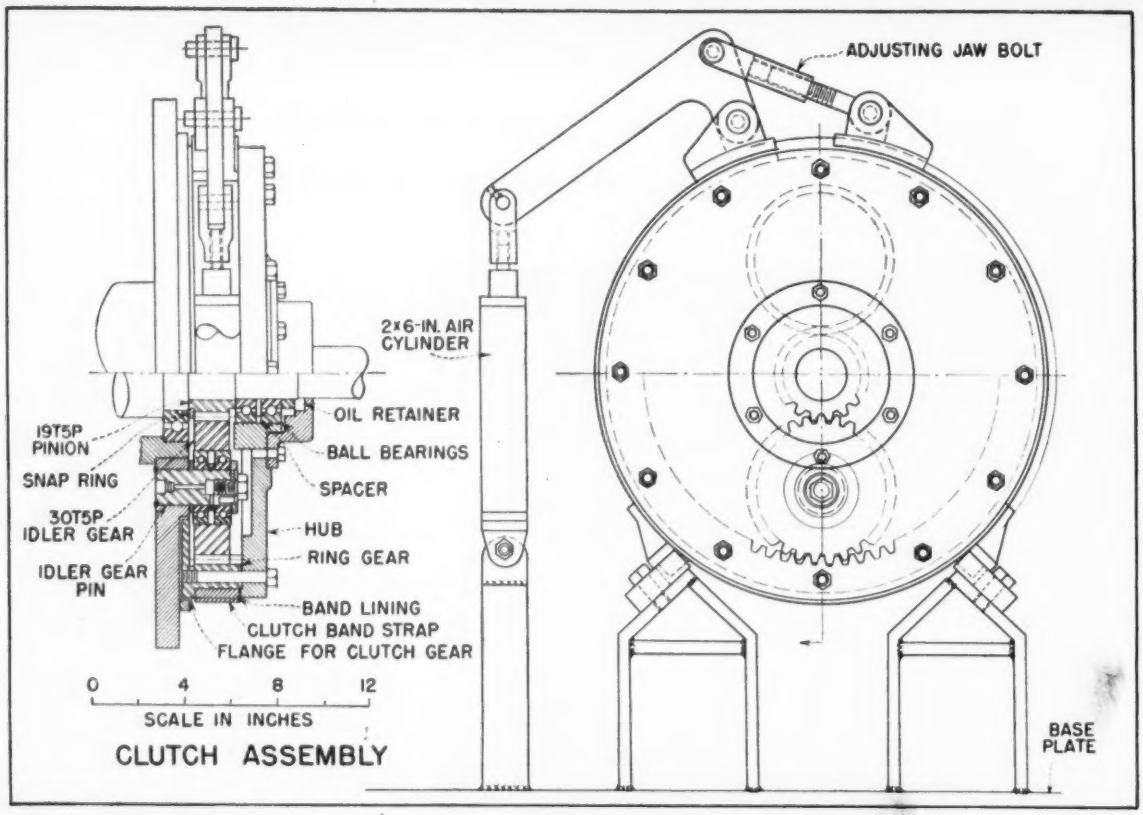


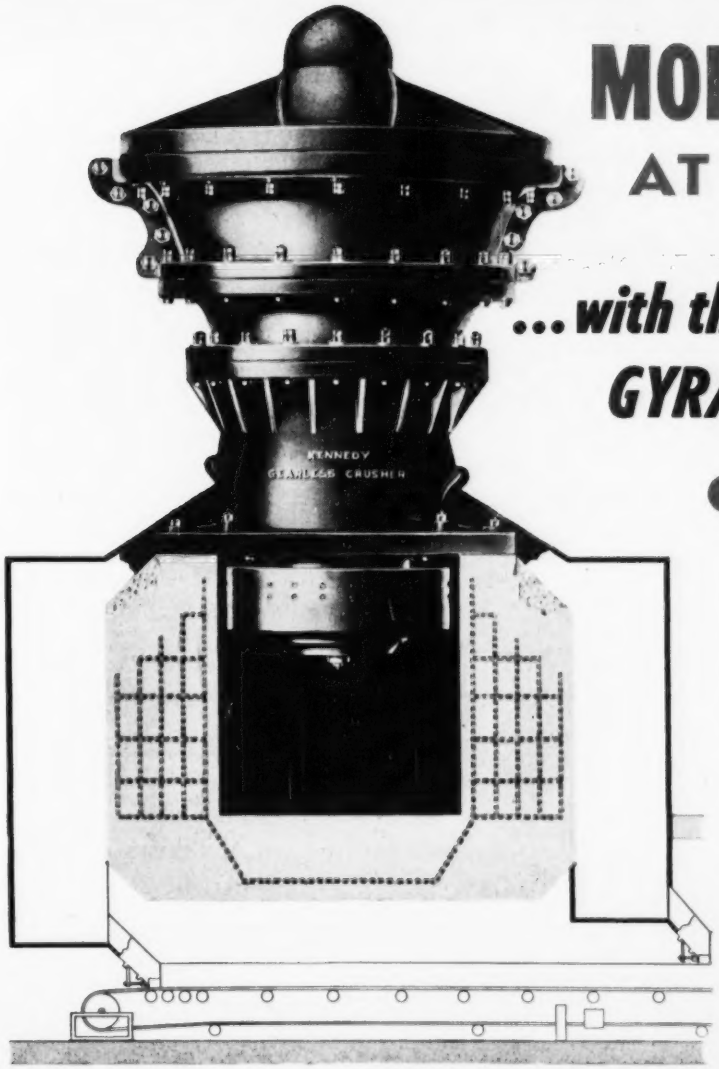
FRONT VIEW OF CAR PULLER which has given satisfactory service for more than two years of continuous action.

PLANETARY-GEAR CLUTCH is designed for remote control. The clutch band acts as a brake enabling smooth operation.

puller cable. He then signals the motorman who disconnects the locomotive, and leaves the train. Thereafter the conveyor operator spots and loads the cars at will.

The car puller is remotely controlled by the conveyor operator. This is possible because of the planetary gear clutch in the puller which is designed for remote control. When the train is loaded, the clutch is disengaged, and the gathering locomotive pulls the loaded train out with the car-puller cable still attached. It stops just long enough for the conveyor operator to disconnect the cable when the tail car reaches the loading point. Another advantage of the planetary gear clutch is this—if the operator pulls a car past the loading point, he can disengage the clutch and allow the train to roll back and stop it by re-engaging the clutch without breaking the cable because the clutch band acts as a brake.

Two of these car pullers are in use at Miami, one of which has been in continuous operation for more than two years. Performance during this length of time has proved the Miami car puller to be satisfactory.



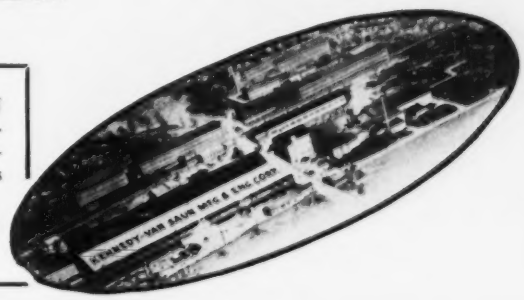
MORE TONNAGE
AT LOWER COST
...with the NEW KENNEDY GYRATORY CRUSHER!

More rock products . . . more uniformly crushed . . . in less time. That's the result with the new KENNEDY Gyratory Crushers. DOUBLE DISCHARGE outlets handle all types of rock containing as much as 50% clay *without sticking*! NO other crusher approaches this performance.

Lower operating cost . . . less maintenance and more crushing power per kilowatt! The synchronous motor is built into pulley assembly . . . power used only for crushing . . . no gears to wear! NOTHING performs like a KVS crusher but its duplicate. For peak capacities at lowest operating costs, KVS crushers have no equal.

Send for bulletins describing all KVS crushers.

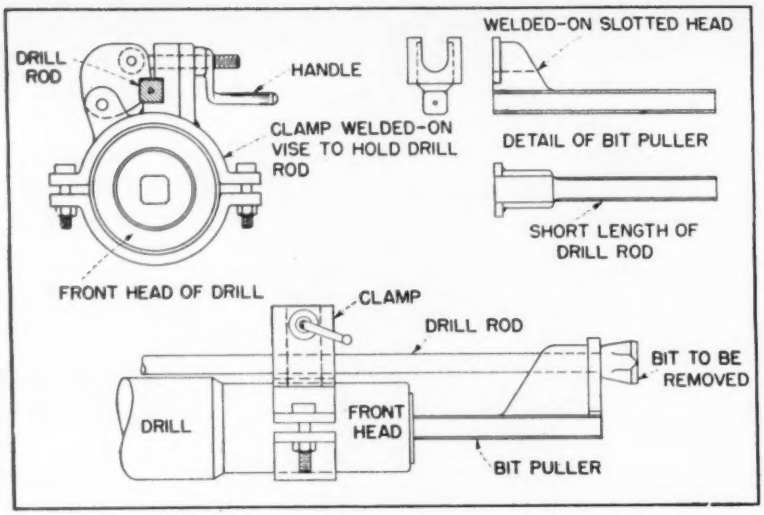
KENNEDY-VAN SAUN MFG. & ENG. CORPORATION, Danville, Pa. Fourteen modern, steel and glass buildings with an aggregate floor area of over twenty acres.



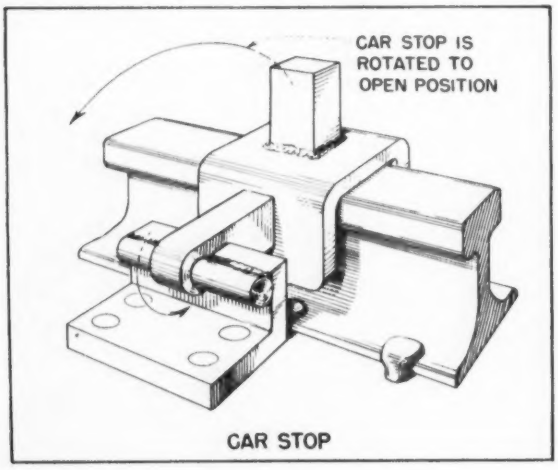
IT COSTS LESS.. TO OWN THE BEST!

KENNEDY-VAN SAUN
MANUFACTURING & ENGINEERING CORPORATION
TWO PARK AVENUE, NEW YORK
FACTORY DANVILLE, PA.

How To Make a Rock Drill Remove Bits



THIS EFFECTIVE bit remover was designed and constructed by Joe Glennon, master mechanic, Idaho Maryland Mines Corp., Grass Valley, Calif., for use by drill crews in drifts, crosscuts, and stopes. It has given excellent service at the Idaho Maryland properties, where detachable bits of the Throwaway type are being removed from drill rods in record time. The principal parts of the remover are: (1) A steel clamp with a welded-on vise to hold the drill rod to be stripped of its bit. This can be attached to the front head of a drifter, stoper, or sinker drill. (2) The piston-like bit puller proper. A short length of drill rod and a slotted head welded on at one end make up the bit puller. Operation is simple and positive. Once the bit puller has been inserted into the drill head and the drill rod placed into the vise, aligned, and locked, a few blows from the drill hammer suffice to remove the bit from the end of the rod.

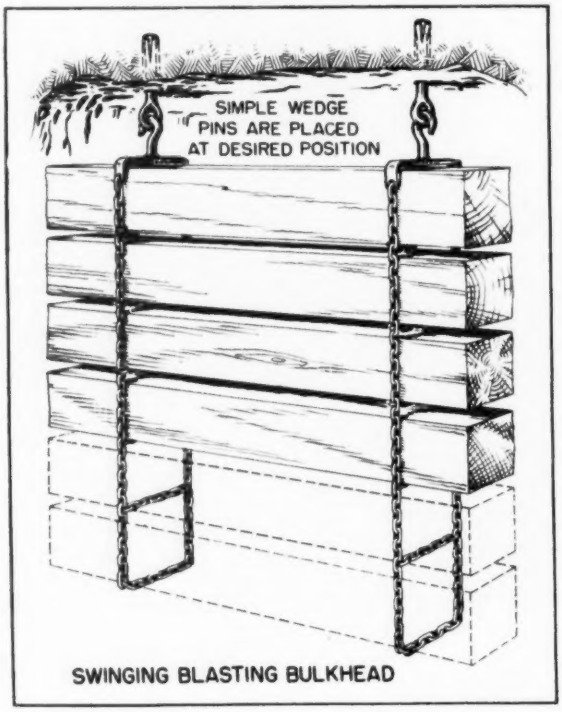


CAR STOP

Two Useful Ideas from North Carolina

C. J. "BUCK" O'DONNELL, mine superintendent, Tungsten Mining Corp., Henderson, N.C., submits these two "helpful hints." The hinged car stop (shown above) is an all-welded device that swings over the rail to prevent cars and timber trucks from crashing into the mine shaft. The hinged stop is attached to a tie, thereby insuring its ready use at all times.

The other item, the swinging blasting bulkhead (at right), is simple to install as shown. Multiple slings that support the bulkhead timber can be made from chain, cable, or strap iron. This bulkhead has been used successfully at Tungsten Mining Corp. to start off drifts and crosscuts from the main haulage level, where the protection it afforded to pipes and cable during blasting of initial rounds proved to be a great advantage. As can be seen, the swinging bulkhead yields only partially to the concussion of the blast, but offers adequate shielding against flyrock.



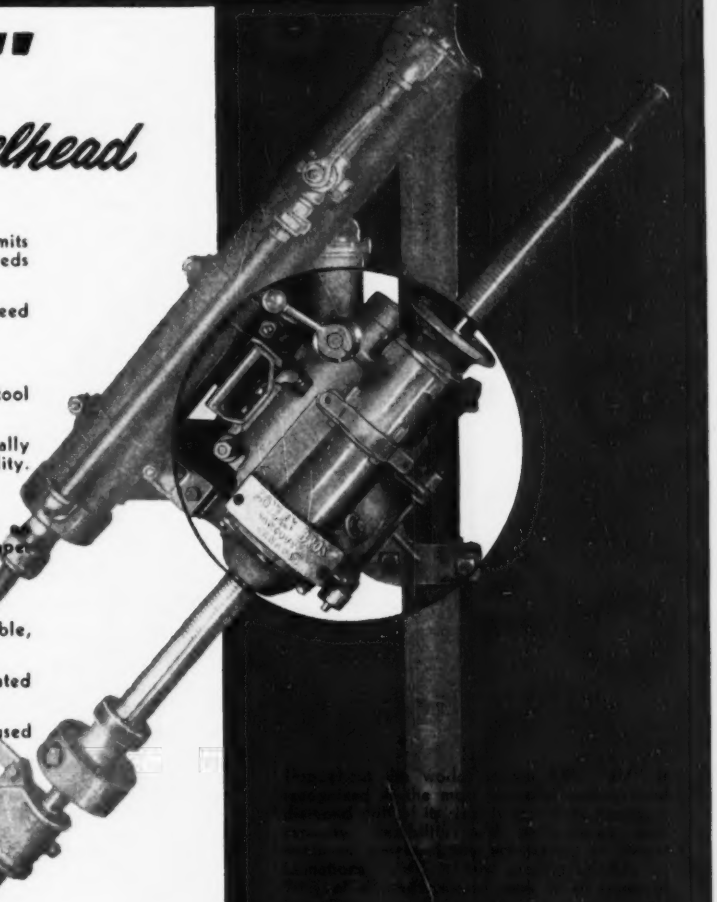
SWINGING BLASTING BULKHEAD

(Editor's Note: It might be added here that one ingenious Canadian operator devised a portable blasting bulkhead by mounting a 5x7-ft. panel of 3-in. lagging on the front end of a mine car loaded with rock. When pushed within 15 ft. of a drift face to be blasted, this unit stopped all fly rock.)

NEW 4-SPEED SWIVELHEAD BRINGS STILL GREATER EFFICIENCY TO WORLD'S MOST POPULAR UNDERGROUND DIAMOND DRILL

BBU "JV"

with 1-JEG *swivelhead*



incorporating these outstanding features:

- newly designed shift mechanism that permits instant shifting to any one of four feeds regardless of bit pressure or speed.
- large exceptionally strong trouble-free feed shifter key.
- short massive countershaft.
- long rigid drive sleeve with built-in tool steel drive sleeve keys.
- drive sleeve bearings spaced exceptionally far apart to give feedscrew maximum stability.
- long full acme threaded feed nut.
- both drive sleeve and feed nut carried on extra large duty, adjustable timken taper roller bearings.
- extra large heavy duty feed screw.
- compact, fully enclosed, easily accessible, unit construction.
- all bearings and moving parts easily lubricated through alemite fittings.
- head readily interchangeable with those used on model BBS-1.

Proved on both core and blasthole work

AT BRITANNIA, B.C.—
where an extensive core drilling program is being undertaken for the Britannia Mining & Smelting Company.

AT KEMANO, B.C.—
where a huge power house for the Aluminium Company of Canada is being constructed inside a mountain.

WE LOOK INTO THE EARTH

BOYLES BROS
DRILLING COMPANY LTD.,
VANCOUVER, CANADA

WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

Sliding-Scale Tax Faces Battle—Malone Maps SEC Fight—Gold Claims Wait Verdict

TWO MONTHS OF THE EISENHOWER ADMINISTRATION have already brought a significant change to the Washington scene. In general, you can observe a determined effort to minimize direct controls on business and to shave the costs of government. Admittedly, this may have occurred without benefit of a new administration. But Eisenhower has accelerated the trend.

As far as mining is concerned, there have been no important policy decisions by the new administration. But the economy drive has had an effect, mostly in a slow-down at DMPA. Purchase contracts, notably a whopper with Canada's Falconbridge nickel, (eventually signed), have been held up for exhaustive review by ODM and the Budget Bureau. This will be more involved than the kind of routine checks the two agencies make regularly on DMPA contracts.

Mining will also be affected by the revamping of government mobilization bureaus. Of primary importance in the reorganization scheme is the strengthening of ODM. The agency will assume the duties of NSRB and the stockpile planning functions of the Munitions Board. The latter will be abolished, its non-stockpile functions transferred to a new office of assistant defense secretary of supply.

RFC may be put into the Treasury Department, and its tin, rubber, and fiber divisions shifted to GSA or the Commerce Department. A diminished NPA will remain in Commerce to administer the new defense materials system, which replaces CMP in July. Under DMS, priorities will be issued to direct military and AEC contractors for procurement of metals, components, and other equipment, and the scarce alloys will be allocated.

Limited DMPA and DMEA functions, providing government incentives for mining production and exploration, will be continued in the Interior Department, or GSA. These will not be too important. Most DMPA programs have been completed, on paper at least, while almost all practicable exploration projects have been considered by DMEA.

Sliding-Scale Tariff

The lead-zinc depression continues to be the major mining problem as viewed from Washington. Sen. Ed. Johnson's proposal to stabilize the market with a government metals credit corporation is encountering serious criticism by mining policy makers and spokesmen here. When lead-zinc producers seek a floor price from the government, the critics warn, the industry must be ready to take a ceiling too. Another objection that's being emphasized: the implied threat to the market from huge government-held stocks.

An alternative measure to aid the lead-zinc industry will be offered in a bill creating a sliding-scale tariff. The bill is now being drafted and will be introduced by Rep. A. L. Miller, chairman of the House Interior Committee, this month or next. It will be along the lines recommended by the National Emergency Lead-Zinc Committee and the Colorado Mining Association at a meeting recently in Denver.

Here is how it would work: the present import duties would be retained, and base prices would be set for the two metals. An extra cent a pound would be added to the tariff for each penny drop in the domestic market price below the base levels. Conversely, the tariff would be reduced as prices increased.

Works On Sugar

Advocates of the bill point out that a sliding-scale tariff has operated effectively on sugar, without serious harm to foreign producers while protecting the domestic industry. A similar metals bill was introduced two years ago, drafted by the San Francisco Chamber of Commerce's Mining Committee, but it never got to the floor of Congress.

One of the big arguments that will be made against the bill is that the new tariff system could be interpreted as a violation of the general agreement on tariffs and trade (GATT), signed at Geneva by the U. S. and 23 other countries in 1948. Parties to the treaty agreed not to impose new trade barriers among themselves.

The U. S. would be withdrawing a concession by creating the sliding-scale lead-zinc import tax, according to this argument. There would then be retaliation. Of the major lead-zinc producers, Australia and Canada are parties to GATT; Mexico is not.

Don't look for favorable action on the new bill this year, for proponents are in for a tough struggle. Washington has been much impressed by a vigorous anti-tariff declaration on metals and minerals in the recent Public Advisory Board for Mutual Security's trade report to the President. The low-tariff point of view will presumably get another boost from another foreign economic policy study to be made for the President by a group headed by Lewis W. Douglas, former Treasury undersecretary and ambassador to Britain.

Sen. Malone's Plans

Sen. George Malone, new chairman of the Senate Minerals and Fuels Subcommittee, has some strong ideas on what to do about mining industry problems. First on his agenda is to bolster the high-tariff cause. His tools: 1, an ambitious study to demonstrate that the Western Hemisphere can be made self-sufficient in practically all minerals; and 2, a fight against renewal of the Trade Agreements Act in June.

The study will be a continuation of an investigation made in 1947 by Malone's old National Resources Economic Subcommittee of the Senate Public Lands Committee. The Trade Agreements Act, which created the reciprocal trade machinery, symbolizes to Malone how the previous administration wrought havoc on domestic mining by stimulating imports. In its passage, Malone declares, Congress surrendered its traditional functions of fixing tariffs on foreign commerce to the executive branch of government.

Next on the senator's agenda is a bill to break what he calls the Security and Exchange Commission's "stranglehold" on the mining industry. Malone claims that SEC has the power to determine feasibility of a mining enterprise before authorizing the sale of securities, and that use of this authority has killed incentives for venture capital in speculative mining projects. Malone has unsuccessfully introduced bills to restrict SEC in previous sessions.

In all fairness to SEC, it must be said that Malone may be exaggerating the agency's function and practice. SEC disputes the senator's charges, declaring that it has no authority to determine feasibility and that it has actually shied away from passing on merits of an enterprise. The agency maintains that its test on mining securities is the same as on other industry stocks, simply a verification of financial disclosures made by the securities' seller.

Gold Mine Claims

Hearings on claims by Homestake Mining Co. and 15 other gold mine operators for damages incurred under the War Production Board's gold mine closing order will end this month. Testimony has been given intermittently over five months. The U. S. Court of Claims is expected to rule on the case late this fall.

The plaintiffs have made these points: 1, the WPB order was not a materials conservation measure, but a move to get 10,000 gold miners, presumably unemployed, to dig copper instead; 2, the move was impractical because there was no authority for the government to switch labor from one industry to another on the basis of essentiality; 3, not more than 100 gold miners went into nonferrous mining and stayed for more than one year.

The plaintiffs have also argued that WPB had conclusive evidence that the gold mine closing order would not relieve the copper industry's manpower shortage or affect critical war supplies substantially.

If the gold mine operators' claims are successful, it will have cost the government about $15-million to shunt no more than 100 miners from gold mines into more critical metal mining during World War II. It is likely that many more claims will be filed if the court rules in favor of the plaintiffs in this case.

Congressional Mining Advisers

Two high-level Washington mining jobs have been filled by former DMPA officials. George B. Holderer, who was chief of the agency's ferro alloys branch, has been named mining consultant to the Senate Interior Committee. Robert S. Butler, a lead and zinc expert in DMPA, has been named to a similar post with the House Interior Committee.

Both positions are very influential. Holderer and Butler will have much to say about mining legislation to be considered by Congress this session.

Holderer is a 67-year-old Coloradoan, and has been a mining engineer in Mexico and South America. He was also a mining and research engineer with the Air Reduction Co., and conducted his own mining consulting business in New York for 20 years.

Butler was a mine manager in Mexico and Missouri for over 15 years and a consulting engineer for several mining machinery manufacturers. In recent years, he has been a mining machinery importer-distributor and vice president of the Callahan Zinc-Lead Co. in Bogota, Colombia. He is 61 years old and was born in California.

Small Business Hearings

The House Small Business Committee has stolen the thunder from the two Congressional mining subcommittees by scheduling on-the-spot hearings later this month for an investigation into mining industry problems, particularly lead and zinc.

Small mine operators will get a chance to sound off to Congress in Denver, April 22-23; San Francisco, April 25; Spokane, April 27; and Phoenix, April 30. Rep. William S. Hill of Ft. Collins, Colo., the committee chairman will conduct the hearings. He says industry testimony will be presented to Congress for consideration of legislative action.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

WHAT TO EXPECT ON TAFT-HARTLEY: Look for revision in June or July despite growing talk that Congress will skip it this session. President Eisenhower and Sen. Taft promised it. But don't look for anything drastic.

Examples:

Dealing With Communists—Non-Communist affidavits for union officials will likely be dropped as ineffective. They did not catch Mine, Mill and Smelter Workers and other left-wing union. In their place bargaining privileges would be denied any union found to be Communist-dominated or to have Communist-bent leaders. Subversive Activities Control Board would make findings.

State Labor Laws—The Lucas "States Rights" amendment has a good chance. It gives life to state laws regulating strikes and picketing. Like the special status Taft-Hartley gives state "Right to Work" laws. This would nullify court decisions setting state laws aside.

Free Speech for Employers—Protection now applicable only in unfair practice cases would extend to elections.

MINING INDUSTRY GIVES ITS VIEWS: House Labor Committee heard witnesses from nonferrous mining for two days. Discussion centered on the Communist problem.

Witnesses included Charles R. Kuzell, general manager of Phelps Dodge in Arizona, and Denison Kitchel, appearing for American Mining Congress; Miles P. Romney, manager at Utah Mining Association; Richard C. Berresford, of New Jersy Zinc Co., and Rufus G. Poole, attorney for New Mexico potash mines.

Mine-Mill officers M. E. Travis, secretary-treasurer, and Orville Larson, vice president, failed to show up to testify, sent prepared statements instead. That way they did not have to undergo questioning from committee members. Committee considered issuing subpoenas. Travis and Larson called for repeal of Taft-Hartley and restoration of Wagner Act, opposed the injunction and any ban on industry-wide bargaining, and asked that union leadership be left to "free choice" membership.

BARGAINING TROUBLE THIS YEAR? Probably. Particularly if mine management bargains "hard." Mine-Mill is documenting usual demand for substantial wage increase. Showdown won't come until after steel settles with CIO around July 1. Later if there is a strike, steel could set pattern.

Union Arguments: High metal prices and profits. "Productivity" increases obtained in railroad, automobile and other industries. In brass, Mine-Mill is talking of 30-hour week with 40-hours' pay, larger fringe benefits.

Industry defense: Cost of living has fallen since last wage increase; metal prices are trending downward.

Note: "Hard" bargaining by United Clay Mines Corp. (with AFL) was found by National Labor Relations Board to be an unfair labor practice. Company refused to make a concession in more than a year of bargaining. Local union finally fell apart. NLRB split 3-2.

CIO PARALLELS COMMUNIST PARTY LINE, SURVEY CLAIMS: Readers of *Engineering and Mining Journal* are well acquainted with how Mine-Mill has followed every twist and turn in the Communist Party line. Now John Yezbak & Co., of Cleveland, has just completed (for Timken Roller Bearing Co.) a study asserting the CIO, from its beginning, has followed the same path. Author says 1949 purge of left-wing unions did not cleanse CIO, that new Communist replacements probably are biding their time—"a sleeping giant."

BRIEF BUT IMPORTANT: Secretary of Labor Durkin may have lost his labor-management-public advisory committee for good when it blew up over Taft-Hartley recommendations. Tri-partism in government is on the wane.

PERSONAL NEWS

E. A. PERRY, formerly assistant general superintendent, has become general manager of Hollinger Consolidated Gold Mines, Ltd., Timmins, Ont. Mr. Perry succeeds E. L. LONGMORE, who has been with Hollinger since 1912, less two years' service as general manager of Wartime Metals Corp. under the Ministry of Munitions and Supply.

T. Dan Mortimer, attorney and formerly executive secretary of the Spokane Stock Exchange, is manager of the offices of the Northwest Mining Association, Spokane, Wash.

Emerson Clark Lane, of Port Orchard, Wash., has been promoted to chief engineer for Frontino Gold Mines, Ltd., Otu, Colombia.

Harold E. Lake, general superintendent, has become manager of the Port Radium development on Great Bear Lake, N. W. T., Can., for Eldorado Mining & Refining Co., Ltd. **Richard E. Barrett,** former professor of mining at the University of Toronto, is manager at Beaverlodge, Alta. **William M. Gilchrist,** former superintendent of Giant Yellowknife Gold Mines, Ltd., is assistant manager at Beaverlodge.

Francis B. Speaker has been appointed director of the mining requirements division of the Defense Materials Procurement Agency, Washington, D. C. Mr. Speaker succeeds **Harold A. Montag,** who resigned to return to the Joy Manufacturing Co., Pittsburgh, Pa.

Josiah Work has been made manager of the Pocatello, Idaho, elemental phosphorus plant, Westvaco Chemical Division, Food Machinery and Chemical Corp.

Dr. Elburt F. Osborn, associate dean of the School of Mineral Industries at the Pennsylvania State College, State College, Pa., has been named dean, effective July 1. Dr. Osborn succeeds **Dr. Edward Steidle,** dean since 1928, who will retire with emeritus rank.

J. Maureese Powelson, formerly with Johnston & Powelson, geologists of Toronto, Ont., has joined the geological and exploration department of The American Metal Co., Ltd., New York, N. Y.

E. L. Ralston has been named manager of Glidden Paint Co. mining properties, directing operations at the zinc and copper mines in Shasta County, Calif., and barytes mines at Battle Mountain and Tonopah, Nev.

Harold J. Bensinger, formerly assistant, has been advanced to sales manager, heavy chemicals department, western, of American Potash & Chemical Corp., Los Angeles, Calif. **Albert F. Swain** has been appointed sales manager, agricultural chemicals department, and **George A. Schnier** is sales manager, refrigerants department. Messrs. Swain and Schnier were both formerly with Eston Chemicals, Inc., which was acquired by American Potash during the past year.

James T. Finlen, Butte, Mont., western general counsel of the Anaconda Copper Mining Co., has been elected a director of the Metals Bank & Trust Co., Butte.

H. A. Swen has been elected vice president and manager of Texas Gulf Sulphur Co., Newgulf, Tex.

SIMON D. STRAUSS, vice president, has been elected a director of American Smelting and Refining Co., New York, N. Y.

W. J. Rundle has returned to the University of Wisconsin, Madison, mining and metallurgical engineering, after a year's leave-of-absence to work for the government in Washington.

James W. Cole has joined the American Cyanamid Co., atomic energy division, as a metallurgical engineer in Winchester, Mass. Mr. Cole was formerly working for the Bureau of Mines in Boulder City, Nev., as a pilot plant operator.

Lloyd L. Austin has been elected a director of American Potash & Chemical Corp., Los Angeles, Calif. Mr. Austin is vice president and a member of the executive committee of the Security First National Bank of Los Angeles and a director of J. W. Robinson Co.

PETER BLACK, assistant to Henry H. Fowler, director of the Office of Defense Mobilization, has become assistant to the president of Freeport Sulphur Co., Langbourne M. Williams, in Port Sulphur, La.

Bert O. Brand has been elected a director of Vanadium Corporation of America, New York, N. Y. Mr. Brand, vice president and secretary, has been with the company for 11 years.

Pablo M. Sada, general superintendent of the Altos Hornos de Mexico, S. A., iron and steel works at Monclova, Coahuila, has been appointed the company's sales manager, with headquarters in Monclova and Mexico City.

L. C. Perkinson, treasurer, has been elected vice president of American Cyanamid Co., New York, N. Y. **G. C. Walker,** assistant treasurer, has been named treasurer.

Harry E. Outcault, manager of zinc oxide sales for St. Joseph Lead Co., New York, N. Y., has retired. The zinc oxide sales department has been consolidated with the metal sales department, and **Charles R. Ince,** vice president and manager of metal sales, becomes vice president and sales manager. **Malcolm Bonynge** and **Dwight**

6x36 WS PREformed Right Lang Lay
Monarch Whyte Strand with IWRC

What's unusual about this machine?

This is a 6 x 36 PREformed rope, made up of 265 wires. That means 265 individual moving parts.

Because any wire rope is a complicated piece of machinery, it must be precision built.

There are 8 different sizes of wire in this rope — each drawn to exacting specifications for material and size.

Outside wires are one size. Inside wires are another. Core and filler wires are still other sizes.

All wires are cold-drawn to precise diameters so they will fit with snug uniformity into the structure of each strand.

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Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel Wire Rope and Wire Rope Assemblies. Mill depots: New York Pittsburgh • Chicago • St. Paul • Fort Worth Portland • Seattle • San Francisco • Los Angeles • Distributors throughout U.S.A.

Marshall continue as assistant sales managers in metal sales and **Robert H. Crossley** becomes assistant sales manager in charge of zinc oxide sales.

ARTHUR R. CAHILL, vice president and treasurer of Montgomery Ward & Co., has been elected the assistant treasurer of International Minerals & Chemicals Corp., Chicago, Ill.

John S. Gates has been elected treasurer of Foote Mineral Co., Philadelphia, Pa., succeeding **Gordon H. Chambers** who continues as president. Mr. Gates was formerly secretary and assistant treasurer of the Lehigh Coal and Navigation Co.

Myron Read has been appointed plant manager of the Fort Dodge, Iowa, gypsum plant of Certainteed Products. Mr. Read joined the company in 1945 as a mining engineer.

Dr. Scott Turner, past president of the American Institute of Mining and Metallurgical Engineers, has been elected president of the American Institute of Consulting Engineers, New York, N. Y.

V. A. Brussolo, former vice president of Soriano & Co. in Manila, P. I., who is now connected as consultant with DMPA, in the Minor and Light Metals Section, Washington, D. C., recently returned from an inspection trip to the Seward Peninsula, Alaska, in connection with the Lost River mine of the U. S. Tin Corp.

F. J. Koegler, Toledo, Ohio, has been elected a vice president of National Lead Co. and general manager of the newly formed Doehler-Jarvis Division. With Doehler-Jarvis Corp. since 1913, Mr. Koegler was elected president last year.

W. B. Moore has been named manager of chemical and petroleum market sales for Reynolds Metals Co., Louisville, Kentucky. Mr. Moore, who joined Reynolds in 1949, was formerly chief engineer for the University of Louisville's Institute of Industrial Research.

Dr. Carl Gommel has been appointed to the engineering staff of the Colorado School of Mines Research Foundation, Golden, Colo. Dr. Gommel was formerly mill superintendent with Aramayo de Minas in Bolivia.

O. D. Niedermeyer has been named vice president of Nickel Processing Corp., New York, N. Y., and general manager of its nickel plant at Nicaro, Cuba. Mr. Niedermeyer had been manager of National Lead's antimony mines and mill in Mexico and Texas.

Merle H. Guise, consultant of New York, N. Y., is now in Brazil for his second examination in the last year. Mr. Guise has been making examinations for gold in Bahia and for Natural Resources for Brazilian interests in and around the Amazon jungles.

William Bellano has been appointed chief project engineer in charge of mining for International Minerals & Chemical Corp.'s engineering division, Chicago, Ill. Mr. Bellano was manager of the Marianna division mines, Pond Creek Pocahontas Co. **James L. Taylor**, formerly chief engineer for the Potash Division's Carlsbad operations, has become chief project engineer in charge of construction. **Robert F. Marek**, formerly industrial engineer, has been made chief project engineer in charge of industrial engineering.

Dwight H. Plackard has resigned as manager of the New Mexico Mining Association to publish a neighborhood newspaper in Albuquerque.

Dr. J. Harlan Johnson has returned to the Colorado School of Mines, Golden, where he teaches geology, after six-months' study of the western Pacific reef islands for the U. S. Army engineers.

Dr. E. J. Workman, president of the New Mexico Institute of Mining & Technology, Socorro, N. M., has been appointed as one of two directors from New Mexico of the El Paso, Tex., branch, Federal Reserve Bank, Dallas, Tex.

PAUL B. JESSUP, vice president of Day Mines, Inc., Wallace, Idaho, has been appointed assistant treasurer of Kennecott Copper Corp., New York, N. Y.

C. E. McManus, formerly assistant general manager of Hollinger-Hanna Ltd., operating for the Iron Ore Company of Canada in the Quebec-Labrador iron ore project, has been appointed project manager in charge of all operations. **Messrs. J. A. Little** and **A. J. LeBlanc** are assistant managers.

C. P. Keegel is now located at Santiago de Cuba, Cuba, where he is presently engaged in mining appraisal work.

E. C. Roper, general manager of Britannia Mining & Smelting Co., Ltd., Britannia Beach, was elected president of the Mining Association of British Columbia, succeeding **M. M. O'Brien**, managing director of Bralorne Mines, Ltd., Vancouver.

Donald D. Smith has been elected chairman of the board of Central Eureka Mining Corp., San Jose, Calif. **H. J. McPherson** succeeds him as president of the company. Mr. McPherson and **Robert E. McDonald** were elected directors.

NORMAN A. STOCKETT has retired as general mill superintendent of all the southeast Missouri mills of the St. Joseph Lead Co., Butte, Mont., after 36 years' service.

Walter F. Meckel, formerly mill superintendent for Compañía Minera Unificada del Cerro de Potosi, has left the employ of the Hochschild interests and is at present residing at 652 Avenida Grau, Magdalena Nueva, Lima, Peru.

Joseph Rosenblatt, president of Eimco Corp., has been named chairman of the Salt Lake City, Utah, branch, Federal Reserve Bank of San Francisco, Calif.

Henry T. Mudd, vice president and general manager of the Cyprus Mines Corp., Los Angeles, has been elected a director of California Bank, Los Angeles, Calif.

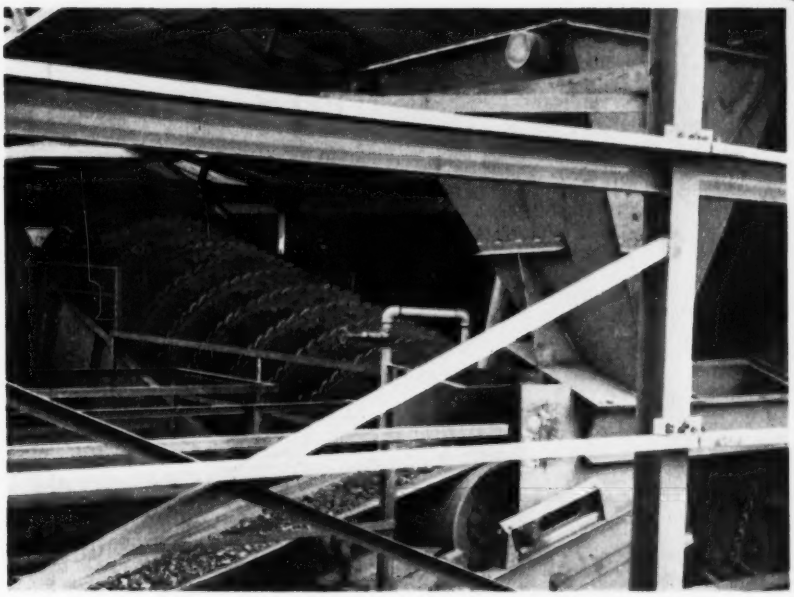
Henry B. Fry, deputy manager, has been appointed manager of the AEC's New York, N. Y., operations office. Mr. Fry succeeds **W. E. Kelley**, who is retiring from government service to return to private industry.

R. D. Satterley has been appointed manager of iron ore mines and **Howard M. Graff**, assistant manager, of Inland Steel Co., Ishpeming, Mich.

E. E. W. Kearly is now in Tacna, Peru, with the Northern Peru Mining & Smelting Co., an affiliate of American Smelting & Refining Co.

Otto Herres, vice president of the Combined Metals Reduction Co., Salt

REPEAT ORDER for 84" Akins Separator



on Iron Range

ORDER BASED ON ACTUAL OPERATING RESULTS

One of the large companies on the Iron Range installed an 84" Akins Separator in its pilot plant. It was so successful in making the desired separation that another 84" Akins was ordered for one of their other plants.

You, too, can have all of the advantages of Akins' outstanding metallurgical and mechanical performance.

Write for Heavy Media Separation Bulletin No. 49

• • • • *Akins—the ORIGINAL spiral-type classifier* • • •

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AKINS CLASSIFIERS • SKINNER ROASTERS • LOWDEN DRYERS

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A SUBSIDIARY OF THE MINE & SMELTER SUPPLY CO.

Lake City, Utah, has been elected vice chairman of the Mining Standards Board of the American Standards Association representing the metals group.

L. J. Bechaud, Jr., formerly with M. A. Hanna Co., Hibbing, Minn., is now chief research metallurgist in the laboratory for Newmont Mining Co. at the property of Empire Star Mines, Grass Valley, Calif.

James A. Barr has resigned as chief, Industrial Minerals Branch, Defense Materials Procurement Administration, Washington, D. C., to return to his private consulting practice in Mt. Pleasant, Tenn.

Dr. John A. Hipple, chief of the atomic section, National Bureau of Standards, Washington, D. C., has been named director of the Mineral Industries Experiment Station at Pennsylvania State College, State College.

Ernest A. Remesch has joined Foote Mineral Co. as superintendent of the new lithium processing plant at Sunbright, Va.

A. J. Cayia, manager of the iron mines and quarries of Inland Steel Co., has been made vice president and general manager of Inland's new iron ore subsidiary, Caland Ore Co., Ltd., Steep Rock Lake, Ont.

J. S. Mitchell has transferred from the Chelan, Wash., division of Howe Sound Co., where he was mill superintendent, to the Calera Mining Co. refinery, Garfield, Utah, as assistant superintendent. **M. E. Defoe**, formerly metallurgist, succeeds Mr. Mitchell as mill superintendent at Chelan and **Fred Robertson** has been appointed mine foreman.

Ernest Oppenheimer, 73, has resigned as permanent director of the Anglo American Corp., Johannesburg, U. S. Africa. Mr. Oppenheimer has been elected an ordinary director and chairman of the organization.

Martin D. Kierans has joined the geological and exploration department of Cia. Minera de Peñoles, S. A., which is located in Monterrey, Mex. Mr. Kierans was formerly exploration geologist with Granby Consolidated Mining, Smelting and Power Co., Allenby, B. C.

Louis McLouth has retired as advertising manager after 33 years with the Sauerman Bros., Inc., Chicago, Ill. Mr. McLouth will remain temporarily with the firm in an advisory capacity.

W. H. Wamsley, formerly with Climax Molybdenum Co., Climax, Colo., is now mine superintendent with Pacific Coast Borax Co. at Boron, Calif.

Ira K. Hearn, assistant to the president of Kennecott Copper Corp., New York, N. Y., has been transferred to Salt Lake City, Utah, as assistant to **J. P. Caulfield**, general manager of the western mining division.

OBITUARIES

Col. J. Wilson Furness, 79, mining engineer and former official in Bureau of Mines and Commerce, died March 4 in Asheville, N. C.

M. W. Ferraro, 66, Albuquerque, N. M., one of the owners of the Shamrock Gold Mining Co., died Jan. 11.

Philip S. Morse, Brookline, Mass., passed away March 1. Mr. Morse practiced mining engineering in western United States, Australia, and Europe.

George H. Austin died February 7 near Lakeview, Idaho, at 77. Mr. Austin organized and later sold the Rainbow Mining Co. in 1942 to Coeur d'Alene Mines Corp. of Wallace. He then organized the New Rainbow Mining Co., of which he was president and manager, in 1947.

APPRECIATION

Franklin E. Turton

Franklin E. Turton, vice president of Braden Copper Co., passed away Dec. 21, 1952, at his home in Coya, Chile, of a heart attack.

Mr. Turton was born in Oakland, Calif., on June 15, 1891, and graduated with honors as B.A. in geology from the University of California in 1915. He went to Chile that same year to work for Braden Copper Co., a subsidiary of Kennecott Copper Corp.

Mr. Turton stayed with Braden Copper Co. for the rest of his life. He became assistant mine superintendent in 1918, mine superintendent in 1927, assistant general manager in 1930, general manager in 1944 and vice president in 1951, that being Kennecott's first appointment of a vice president resident in Chile. He was also a director of Braden Copper Co.

Mr. Turton was a terrific worker, an outstanding mining engineer and a sound, forward-looking organizer. He had in addition an uncommonly congenial and likeable personality that earned him the esteem and affection not only of his associates but of the great body of his employees and workmen, as well as of all those with whom he had official or social contacts. He was always a sincere friend of Chile and the Chileans, making their problems his own with remarkable understanding and practical cooperation.

In July, 1950, the President of Chile decorated him with the "Bernardo O'Higgins" Order of Merit in recognition of his excellent work and good citizenship.

His sudden death has been deeply regretted by his many friends and associates in Chile and in copper business circles in the United States. His memory will serve as an example of the benefits a good, active mind, combined with a kind heart, can confer not only upon the man who possesses them, but upon all those with whom he comes in contact.

C. D. MICHAELSON

General Manager

Braden Copper Co.

Harold Tourtel Herivel

Harold T. Herivel died in Morenci, Ariz., on Nov. 17, 1952, after a long illness. He was born in St. Anne on Alderney Island, Great Britain, on Sept. 30, 1889.

After receiving his engineering education at the Missouri School of Mines and Metallurgy, he began his professional career at Morenci in 1916. Service as an officer in the U. S. Army Engineer Corps in France in 1918 and 1919 interrupted his work. Then followed five years of mining work in Mexico during which he acquired, in addition to valuable experience in mining, his ability to speak Spanish fluently. While there, he married Harriet L. Thomas in Guadalajara.

His liking for Morenci led him to return in 1924 to become testing engineer of the No. 6 concentrator and in 1930 to operate the test concentrator until 1932 on treatment of the ore, which later became the open pit mine. During the period 1932 to 1938, he was occupied on milling work in California and Tennessee and again in Arizona on soil conservation, in which he reached the rank of district engineer.

In 1938, he was called back to employment by the Phelps-Dodge Corp. As metallurgist of the 2000-ton test concentrator, he assisted in the work by which the design of the present Morenci concentrator was determined. He continued during the operation of the 50,000-ton plant as metallurgist, general foreman, and in 1950, as concentrator superintendent. His work on that project contributed much toward its success.

"Spike," as his many friends in all phases of his work and life knew him, was universally liked and was respected for his character and knowledge. His firm but fair handling of labor problems, his humor, and his shrill whistle will be long remembered in the Morenci concentrator.

BEN H. CODY

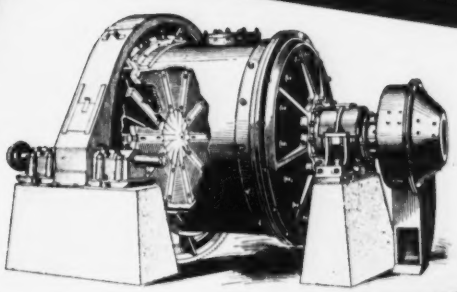
Phelps-Dodge Corp.

Morenci, Ariz.

12′ MARCY BALL MILLS

save a Michigan copper company

$500,000



DESIGNED ESPECIALLY FOR THIS NEW INSTALLATION

Mine and Smelter engineers, in cooperation with this copper company, designed a 12′6″ x 13′ Marcy Grate Discharge Ball Mill to best meet the problems of this new 10,500 ton-per-day copper mill, and to cut capital cost of equipment.

The operating company estimates they will save $500,000.00 in capital costs by using these large mills instead of smaller diameter mills.

LARGEST BALL MILLS EVER BUILT

These 12′6″ x 13′ Marcy Grate Discharge Ball Mills are the largest ball mills ever built for the mining industry. Each one will use a 1500 hp. motor.

You, too, can have the advantage of M&S specialized grinding engineering service . . .

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The Mine & Smelter Supply Co.

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REPRESENTATIVES IN FOREIGN COUNTRIES

NOW! complete your drilling equipment with a drill steel that's a tool steel CRUCIBLE —◆CA◆— **DOUBLE DIAMOND HOLLOW DRILL ROD**

That's right! Just as hundreds of satisfied users have done . . . complete your drilling equipment with the finest, toughest hollow drill rod made. Save expensive tungsten carbide bits, time . . . and money. New, Crucible Double Diamond puts drill rod in the tool steel class . . . because Double Diamond is an *alloy* drill rod made by drill rod specialists to tool steel specifications.

Find out first hand about this advance in hollow drill rod. **WRITE, PHONE or WIRE!** Do it now!

CRUCIBLE first name in special purpose steels

53 years of Fine steelmaking

HOLLOW DRILL ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • REZISTAL STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

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NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card—insert and mail.

World's Largest Heavy-Duty Truck Placed in Service

First 60-ton unit, now working at Bagdad, Ariz., to be followed by five more later this year

AVOIDING THE COURSE of merely scaling up conventional design for off-highway, heavy-duty trucks, the Dart Truck Co., Kansas City, Mo., has combined advanced engineering with well-tested practices in constructing its newest truck, which is of 60-ton capacity. One of these trucks, shown here in service in Bagdad Copper Corp.'s open-cut mine in Arizona, will be joined by five more at this property before the year is out. Specifications of the truck are given in the adjacent table.

Most noticeable feature of the new design, the twin 350-hp. engines have been removed from the conventional place under the hood in front of the driver to a point midway on each side, respectively, under the body, between the front and following wheels. This affords accessibility with ease of maintenance, which is reflected in decreased time lost for servicing. With the unique fluid drive, the engine power is directed to each of the two rear planetary axles.

Other features of construction include hydraulic systems for steering and hoisting, with pressures up to 1500 psi; a cooling system which requires almost 100 gal. of antifreeze; rear springs with leaves of special spring steel almost 2 in. thick; and a front-end suspension which floats on captive air, providing an almost friction-free bearing. Steering power is provided by hydraulic arms located on either side of the front axle.

TWO 350-HP. DIESEL ENGINES, positioned one on each side midway beneath body, power Dart's huge new 60-ton truck.

Specifications—Dart Model 600 Truck

OVERALL LENGTH, 32 ft. 8 in.

WEIGHT, G. V. W., 240,000 lb.

OVERALL WIDTH, 11 ft. 8½ in.

OVERALL HEIGHT, 11 ft. 6 in.

ENGINES, Two Buda 8 DAS—1125 diesel engines. Total, 700 hp. gross. Each engine is connected to a rear axle through separate torque converters. Use of Cummins NHRBS 600 engines or the Waukesha WAKDS and WAKR is optional.

TORQUE CONVERTERS, Twin-disc three-stage with 5-to-1 torque multiplication and down-hill brake features. Each torque converter is charged with diesel fuel supplied from fuel tank. This fluid is the working medium through which the converter transmits energy. The converter fluid (diesel fuel) is circulated through a heat exchanger which cools the converter.

TRANSMISSIONS, Twin-disc reverse box with 1 to 1 forward and 1 to 1 reverse ratios.

STEERING Twin, double-acting hydraulic boosters providing 56,000 lb. steering effort.

BRAKES, 9-in. x 20-in. diameter brakes on all axles. Total brake lining area, 2550 sq. in.

HOISTS, Twin hydraulic hoists rated at 130,000 lb. push at 1000 psi. hydraulic pressure. Hoists have built-in snubber and pull-down mechanism.

FRAME, Full box section 27 in. wide x 19 in. deep with ¾-in. top and bottom plates and ⅜-in. side plates. Frame has extra reinforcement in highest load positions to reduce stress.

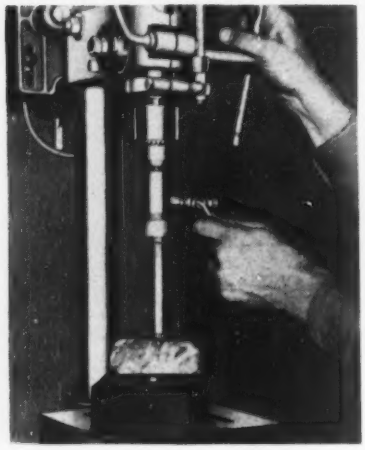
FRONT AXLES, 85,000-lb. capacity. Cast of high-alloy steel. Front axle has center pivot to allow axle oscillation over irregular terrain.

REAR AXLES, Tandem rear axles—85,000-lb. capacity each. Triple reduction featuring 5:1 reduction in planetary wheel. Overall reduction of axle may be 12:57:1, 15:23:1, or 20:6:1 to provide ratios for complete coverage of operating conditions. Cast of high alloy steel.

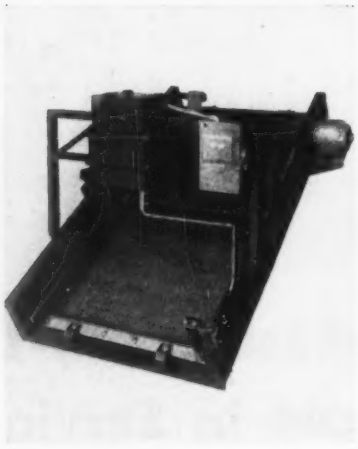
TIRES, (Maximum Rating) 18.00 x 25, 32-ply dual tires on all axles. Total of 12 tires which give a total tire capacity of 244,200 lb.

COOLING SYSTEM, 34-gal. liquid cooling capacity for each engine. The amidship-mounted engines are connected to the radiators at front by brass tubing. Each radiator has 118,432 sq. in. of radiation to dissipate engine and torque converter heat.

HYDRAULIC SYSTEM, System is operated by two vane-type hydraulic pumps which pump a total of 144 gpm at 1,000 psi. Hydraulic system is used for power-steering and for hoisting the body. A hydraulic pump is connected to each engine so that the system is active with one engine stalled.



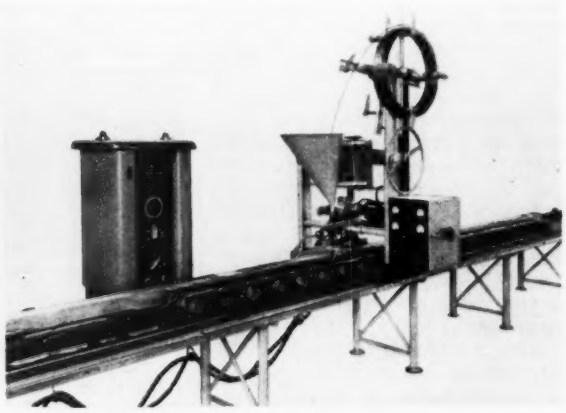
WATER SWIVEL for diamond drilling can be mounted in ½-in. chuck on any drill from ¼-in. to 2½-in. diameter. Offers fast roof-bolt holes. Wheel Trueing Tool Co., Detroit. (2)



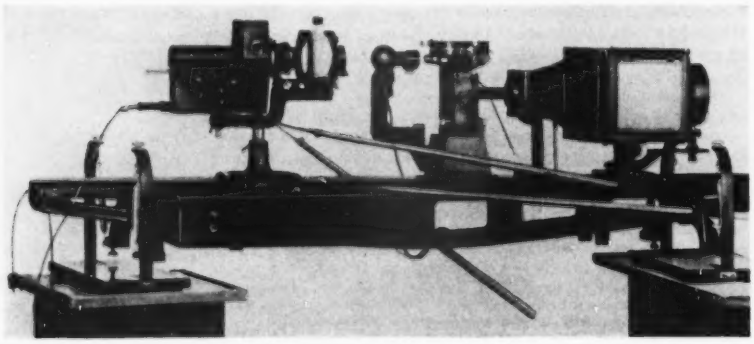
VIBRATING SCREEN is electrically heated to prevent blinding by encrustation of fines when screening sticky ore. Heat is varied by knob on transformer. Deister Concentrator Co. (3)

"HYDRA-SET" permits rigger to ease load into position with needle valve at load after craneman has positioned it a few inches above destination. Mefco Sales & Service Corp. (4)

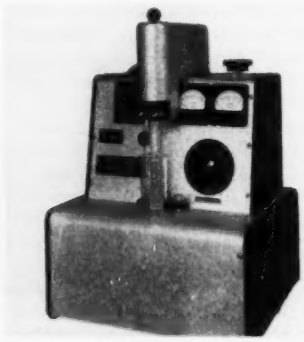
PIPE WRAPPING, designated "Scotchrap" No. 50 and 51, offers the anti-corrosion qualities of poly-vinyl chloride and ease of application of tape to protect your pipe. Minnesota Mining and Mfg. Co., St. Paul, Minn. (5)



AUTOMATIC WELDER provides for both low and high voltage welding, lineal or cross-head, on flat or circular shapes, continuous or in sequence. Saves metal, offers uniform welds. Sight Feed Generator Co. (6)



METALLURGICAL MICROSCOPE includes arc lamp, low-voltage lamp, mirror reflex camera and optical bench equipped with anti-vibration suspension device for all known phases of surface examinations; bright and dark field, polarized light, transmitted light and phase contrast. Ground glass screen is 7 x 7-in. Magnifies from 4 to 2200 times. William J. Hacker & Co., N. Y. (7)



ELECTRO-ANALYZER is said to give a copper assay in eight minutes. How the unit achieves this speed and other information can be obtained from Eberbach Corp., Ann Arbor, Mich. (8)

FLEXIBILITY
with side-dumps only!

WITH EASTON SIDE-DUMP FLEXIBILITY you can change quickly from a single dump truck to a large capacity truck-and-trailer combination — or from a single trailer to either a truck-and-trailer or a double-trailer combination. This flexibility, *possible only with side-dump equipment*, provides for rapid, low-cost conversion to meet changing job-to-job requirements, increased production requirements, or newly developed job conditions. You make your best plans now *and for the future* when you start hauling with EASTON SIDE-DUMPS.

as a TRAILER

EASTON TRAILERS are built in all three of EASTON's basic side-dump designs — doorless pan, lift door and drop door. The unit illustrated is an EASTON TYPE TD automatic drop door trailer, hydraulically dumped.

as a TRUCK BODY

EASTON TRUCK BODIES are also available in the three standard basic EASTON designs and in several capacities. The unit illustrated is an EASTON TYPE BD automatic drop door body, hydraulically dumped.

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EASTON SIDE-DUMPS, of any type, may be joined in truck-and-trailer or double-trailer combinations to be used as single units or in combination, as required. The unit illustrated is an EASTON TYPE TD double-trailer combination, hydraulically dumped. Overall capacity, 45 tons.

B-1096

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Conversion equipment may be supplied for units now in service, as well as on new orders. Consult EASTON for a qualified engineering recommendation. Write today . . .

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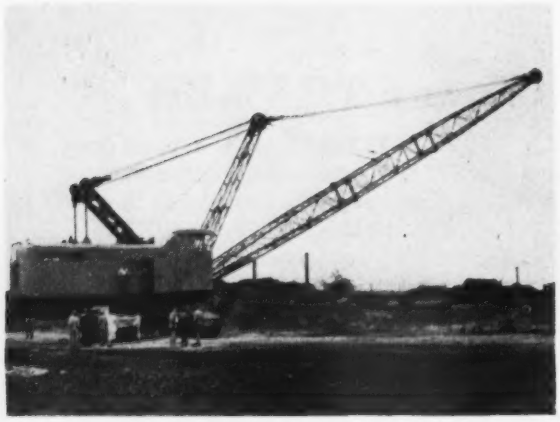
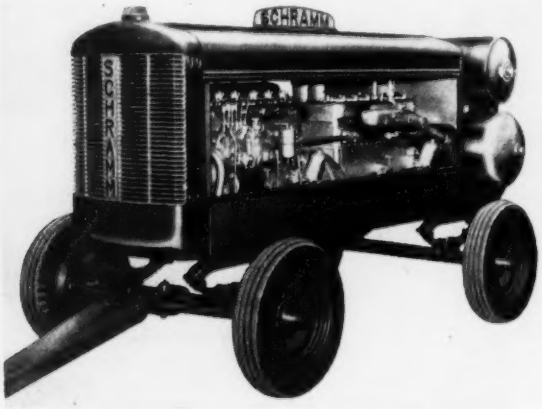


LARGEST DRAGLINE ever mounted on a single pair of crawler frames is this 8-cu.-yd. machine whose every movement is governed by electro-magnetic controls. Diesel engine develops 590 hp. Harnischfeger Corp. (9)

DUMP TRUCK features a single passenger cab next to the engine as part of the design to give maximum payload and maximum maneuverability on a shorter wheelbase. Capacity is 15 tons. Cook Bros. Equipment Co. (10)

PORTABLE COMPRESSOR provides 75 cfm air and will handle a 45-lb. rock drill or a combination of two small tools. Low-cost, gasoline-powered unit weighs only 1280 lb. O.K. Clutch & Machinery Co., Columbia, Pa. (11)



COMPRESSOR delivers 210 cfm at 1200 rpm. Diesel fuel is injected into the engine cylinders by the American Bosch injection system. The 210 "Dezoil" engine-driven compressor is made by Schramm, Inc. (12)

Two-Yard Mobile Shovel Available

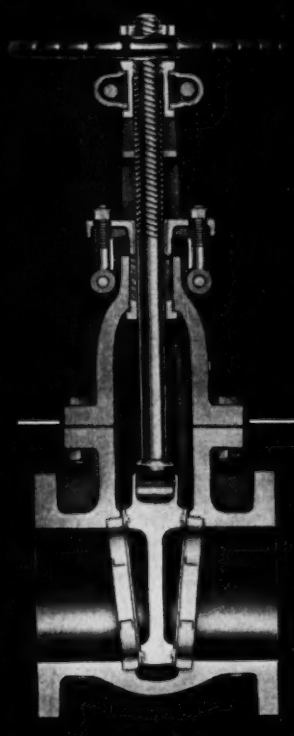
THE FIRST HIGHLY MOBILE track-type shovel of 2-yd. capacity is now available from Caterpillar Tractor Co., Peoria, Ill. It will be called the No. 6 shovel.

The new shovel will be powered by a 66-drawbar-horsepower crawler on a non-oscillating track frame. It is an integral unit with the tractor shovel frame bolted and welded at widely separated points on the tractor engine support channels and the transmission housing. It is designed from the ground up for excellent balance and great stability.

Rear mounting of the hydraulic system permits better radiator cooling and, along with the high seat position, better visibility. The lift cylinders are horizontally mounted above the tracks to avoid the possibility of clogging with dirt. Side door panels prevent dirt from getting to the engine.

Dumping height is 10 ft. 9 in. with a reach of 3 ft. 5 in. insuring dumping of materials in the center of all standard hauling units.

To keep operator fatigue at a minimum, control levers for the bucket and lift arms may both be operated with one hand. The hydraulic lift arm control lever, once engaged, remains in position without holding. The operator has both hands free to shift gears or turn the shovel, while the bucket continues lifting. At maximum lift, an automatic kickout disengages the lever. (13)



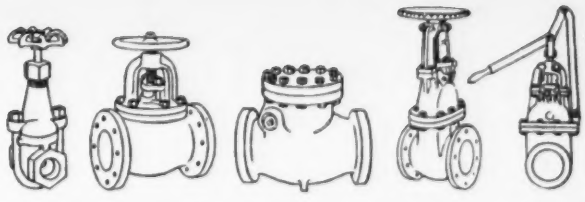
IRON

COMPLETE LINES OF IRON VALVES AND PIPE FITTINGS are manufactured by Walworth in a variety of types, pressure ratings, sizes, and patterns for general industrial use.

Walworth also manufactures complete lines of valves (including Lubricated Plug Valves), and pipe fittings made of steel, bronze, and special alloys.

These valves and pipe fittings, plus Walworth-made pipe wrenches total approximately 50,000 items and are sold through distributors in principal centers throughout the world.

Walworth engineers will be glad to help you with your problems. For further information call your local distributor, nearest Walworth sales office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, New York.



Iron valves in gate, globe, angle, check, and lubricated plug types are manufactured by Walworth. Illustrated is a sectional view of a Walworth No. 726F Standard Iron Body, Bronze Mounted, Wedge Gate Valve with flanged ends. This line of valves is available in sizes 2 to 30 inches. Similar valves of All-Iron type are also available.

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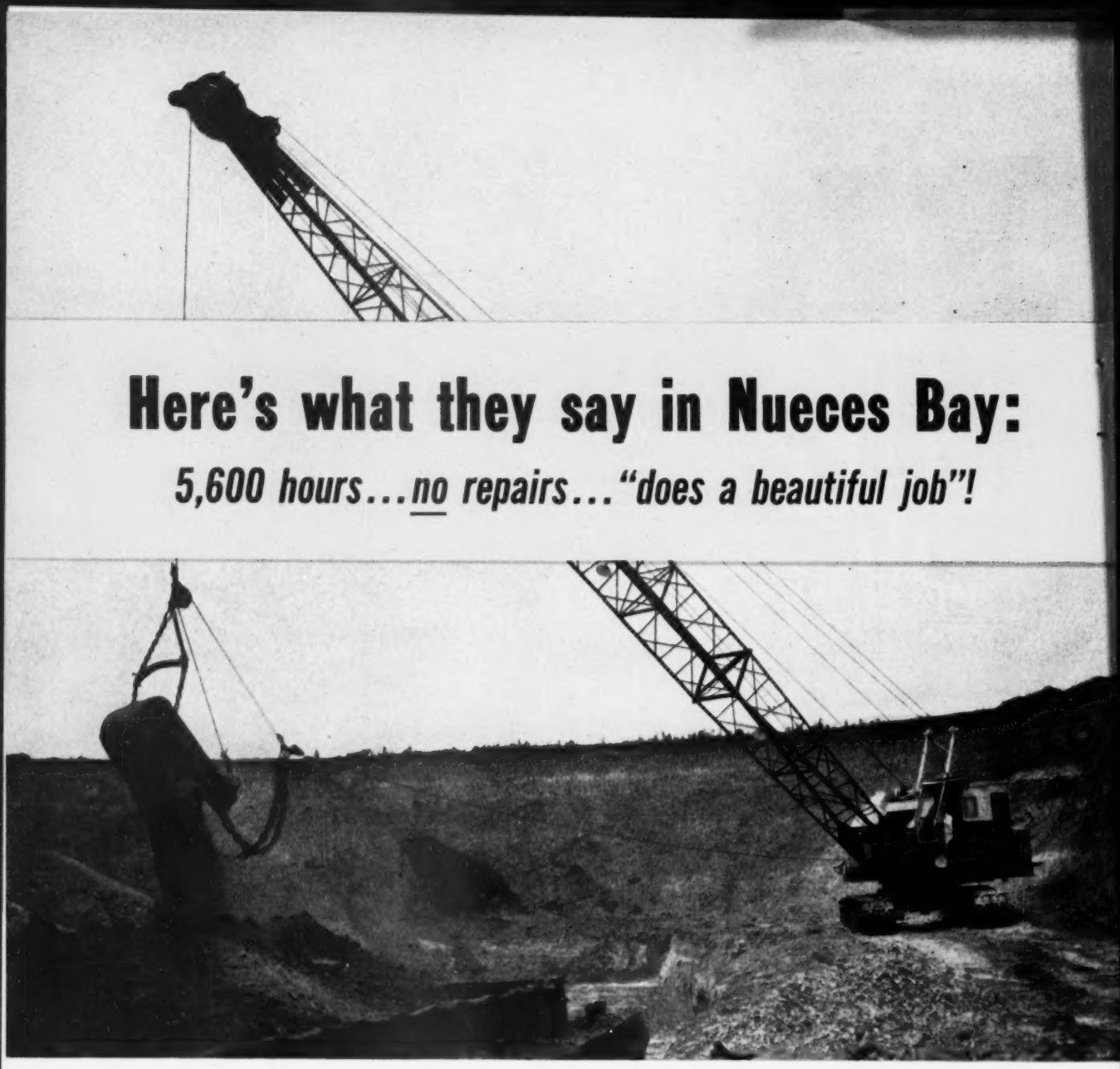

Here's what they say in Nueces Bay:

5,600 hours...no repairs..."does a beautiful job"!

Alongside Nueces Bay near Corpus Christi, Texas, the Caterpillar D13000 which powers this Marion dragline has clocked 5,600 hours in five years—with *no repairs!* Owned by Halliburton Portland Cement Co., the 1¼-yard bucket handles 100 yards per hour in this clay pit. "It's been a very satisfactory engine," says dragline operator J. J. Turner, "and does a beautiful job with this machine."

Many mines have standardized on Caterpillar Diesel Engines for fast output and peak operator efficiency, for long-lived economy and minimum down time. All Cat* Diesels deliver full power, without fouling, on low-cost No. 2 furnace oil. Leading manufacturers can supply these engines in the mining machinery they build. There are 12 engine sizes to 500 HP, and electric sets to 315 KW.

Talk over your power needs with your Caterpillar Dealer, who will gladly show you on-the-job performance. See for yourself how these rugged, power-packed Diesels can mean more profit for you.

CATERPILLAR, Peoria, Illinois.

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YOUR DEALER
WILL DEMONSTRATE**

Equipment Shorts

FACE SHIELD. A face shield with sufficient clearance to be worn over glasses and industrial goggles has been designed and manufactured by Boyer-Campbell Co., Detroit, Mich. Model No. 301 shield is glove-buttoned to a form-fitting headgear which is readily adjustable to any shape or head size. (31)

MINING MACHINE CABLE. A portable mining machine cable which reduces chance of shock and arcing when a break occurs by cutting off power the instant that the positive conductor insulation is damaged, has been developed for Anaconda Wire & Cable Co., New York, N. Y. (32)

MIDGET FAN. "Aerodyne," a midget fan developed by Jeffrey Mfg. Co., Columbus, Ohio, delivers 6,200 cfm free delivery, using a 5-hp., 3450-rpm motor, built for operating on 220 or 440 vac, or 250 vdc. Fan weighs 340 to 475 lb. (33)

GEOPHYSICAL INSTRUMENT. The "Geovolt" apparatus developed by Georator Corp., Arlington, Va., includes all the instruments and accessories required for prospecting by the self-potential or spontaneous polarization method. In operation natural earth voltage (geovoltage) is measured at a series of previously laid out stations. A map of the measurements is plotted which gives indications of existence of an orebody if one is present. (34)

ELECTRONIC LEVEL INDICATOR. "Telstor," an electronic instrument for continuous level measurement, without mechanical or pneumatic means, is under production by Fielden Instrument Div., Robertshaw-Fulton Controls Co., Philadelphia, Pa. Telstor is usable with tanks, bins, hoppers, pressure vessels, or almost any type of container. Materials that can be measured include almost any type of liquid, viscous fluid or granular solids. (35)

COUPLING. A universal coupling, operating on the ball and socket principle, is available for all types of machinery requiring coupled shafts, either at angle or straight line. The unit features simplified construction with a reduced number of working parts. B. M. Root Co., York, Pa. (36)

HEAT-RESISTANT GLOVES. All-leather, heat-resistant gloves, said to be able to "take" temperatures up to 800 deg. F. are being manufactured by Liberty Dressing Co., Gloversville, N. Y., and distributed by Mine Safety Appliances Co., Pittsburgh, Pa. For details on the gloves circle No. 37 on the postage-free card below and drop it in the mail. (37)

COLD GALVANIZING. A method of cold galvanizing has been developed by Galvanite Corp., New York, N. Y. The method uses "Galvinite," which the company says is not a paint but a galvanizing compound. A company release states, "Despite its considerably lower cost, "Galvanite" equals, and in many cases, outperforms other surface protection techniques including electroplating, hot dipping, cementation, spraying and painting". Half pint costs $2.10; one gallon, $26. (38)

BRAKE LINING. A new method of manufacturing brake lining has been patented by Russell Mfg. Co., Middletown, Conn. Strands of asbestos web are saturated and completely surrounded with a special frictional binder material. This mass is compressed under 300 tons of pressure, effecting a density of 120 lb. per cu. ft. with a tensile strength nearly ten times that of conventional woven brake lining. Grabbing and fade are reduced to a minimum. (39)

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

COMMUNICATION SYSTEM. Four well illustrated pages tell you all about HoistPhone, an communication system designed for two-way conversation between hoisting engineer and cage tender. Operates with cage at any level or in motion. (44)

EARTHMOVING EQUIPMENT. The complete line of Euclid rear-dumps, bottom-dumps, scrapers and loaders with on-the-job photographs, specifications and performance figures are found in a new 48-page book, "Euclid Equipment for Moving Earth, Rock, Coal, Ore." Published, naturally, by Euclid Road Machinery Co., Cleveland, Ohio. (45)

MAINTENANCE AND SAFETY EQUIPMENT. A real Sears Roebuck-type catalog 64 pages of description and details on a complete line of maintenance and safety equipment, is Catalog 29 from Martindale Electric Co., Cleveland, Ohio. (46)

RECTIFIERS. How rectifiers can be applied to various operations is explained in a question-answer brochure from American Rectifier Corp., New York, N. Y. (47)

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to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after June 1, 1953, if mailed in the U. S. or Canada.

Engineering and Mining Journal—April, 1953

NOT GOOD AFTER JUNE 1, 1953—If mailed in U. S. or Canada.

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NEW PRODUCTS DIGEST

SHEAVES. "QD" Sheave Specification Guide #83 from Forth Worth Steel Machinery Co., Fort Worth, Tex., gives dimensions and weights of V-belt sheaves and hubs. Cut-away photographs show construction features, pictorial panels illustrate installation instructions. (48)

SCREW CONVEYORS. Detailed engineering information, with selection tables and horsepower formulas, layouts and arrangements, dimensional data and part numbers for selection of screw conveyors and screw feeders for many applications, are provided in Book 2289 from Link-Belt Co., Chicago, Ill. (49)

RAPPING. A six-page bulletin with illustrated information on the recently developed magnetic impulse continuous electrode rapping system for electrostatic precipitators, is offered by Research Corp., Bound Brook, N. J., makers of Cottrell Precipitators. (50)

POWER TRANSMISSION. Descriptions and list prices for V-belts, detachable link V-belting, pulleys, sheaves, roller chain, belt lacing, speed reducers and other power transmission items manufactured by Rockwood Pulley Mfg. Co., New York, N. Y., are contained in a comprehensive 36-page catalog, No. R-103-A. (51)

WIRE ROPE. Latest information on the "one best wire rope" to use with each type of mining equipment has been incorporated into one 16-page booklet, DH-129A, available from Hazard Wire Rope Div., American Chain & Cable Co., Inc., Bridgeport, Conn. (52)

VACUUM CLEANING SYSTEM. If a dirty plant is your problem, take a look at the Exidust central vacuum cleaning system described in this 20-page booklet. Exidust picks up dirt by means of a flexible hose with attachments and passes it through a stationary piping system to one or more collectors. Lamson Corp., Syracuse, N. Y. (53)

DIESEL ENGINES. "What You Should Know About Diesel Engines" is a handy 28-page primer on the diesel engines that makes their operation easy to understand. P&H Diesel Div., Harnischfeger Corp., Crystal Lake, Ill. (54)

POWER SHOVEL. Marion Power Shovel Co.'s Bulletin No. 402-A, describes the company's 111-M diesel shovel with 4-cu. yd. dipper, and highlights its special features. Unit is available as standard shovel, long-range shovel or dragline. (55)

PUMP. The "Jabasco" pump with its neoprene impeller for corrosion service is described in a specification data sheet (No. 97A) put out by American Hard Rubber Co., New York, N. Y. (56)

DENSE CONCRETE. "Plastiment Concrete Densifier" discusses the gel mechanics of cement-water reaction, factors affecting cement hydration and quality of concrete, and how these factors can be controlled to reduce cracking and increase concrete hardness and impermeability. Sika Chemical Corp., Passaic, N. J. (57)

DATA RECORDING EQUIPMENT. "Engineering That Counts" is a 4-page folder that tells you about Data Engineers, Inc., Chicago, Ill., a firm that has been formed for the designing and manufacturing of data recording instrument equipment. (58)

MAGNETIC DRUM SEPARATORS. You can read all about Eriez permanent non-electric magnetic drum separators in six-page Bulletin No. B-601, issued by Eriez Mfg. Co., Erie, Pa. It contains photographs, drawings and tables with information on how to select the right unit. (59)

CENTRIFUGAL PUMPS. Two similar, but functionally different types of vertical, centrifugal pumps are covered in Bulletin No. 3-3000 from Yeomans Brothers Co., Melrose Park, Ill. One is a heavy-duty bilge pump for solids-free liquid; the other a screenless sewage ejector for solids-carrying liquid. (60)

FIRE-FIGHTING. Dry chemical fire extinguishing equipment from truck and mine-car size, to hand extinguishers, are covered in a pocket size booklet issued by Ansul Chemical Co., Marinette, Wis. (61)

FOR SHOWER ROOMS. Onox, Inc., San Francisco, Calif., has a couple of good suggestions for your shower room. First they offer a convenient, efficient, space and time-saving layout and then they suggest skin-toughening of the feet to prevent Athlete's Foot among your working forces. Onox, an odorless, nonpoisonous solution toughens the skin and makes it resistant to fungus attack. Circle No. 62 for information on their interesting trial offer. (62)

ANTI-ABRASION CASTINGS. "Ferrous Castings for Abrasion Resistance" is a 24-page booklet suggesting a system for analyzing service conditions and selecting a ferrous alloy with suitable mechanical properties for the job. Tables, charts and illustrations are used. American Brake Shoe Co., New York, N. Y. (63)

INDUCTION MOTORS. A description of standard construction features and types of construction of large pedestal-bearing induction motors is contained in Bulletin 05B7771 released by Allis-Chalmers Mfg. Co., Milwaukee, Wis. (64)

FORK LIFT TRUCKS. Ransomes & Rapier Ltd., Ipswich, England, would like to acquaint you with their Fork lift trucks with patented cantilever jibs to give the trucks more versatility. (65)

pH, CONDUCTIVITY CONTROLLERS. This 24-page catalog (1550) describes and gives details, on measurement and control of pH, Redox and conductivity. Minneapolis - Honeywell Regulator Co., Philadelphia, Pa. (66)

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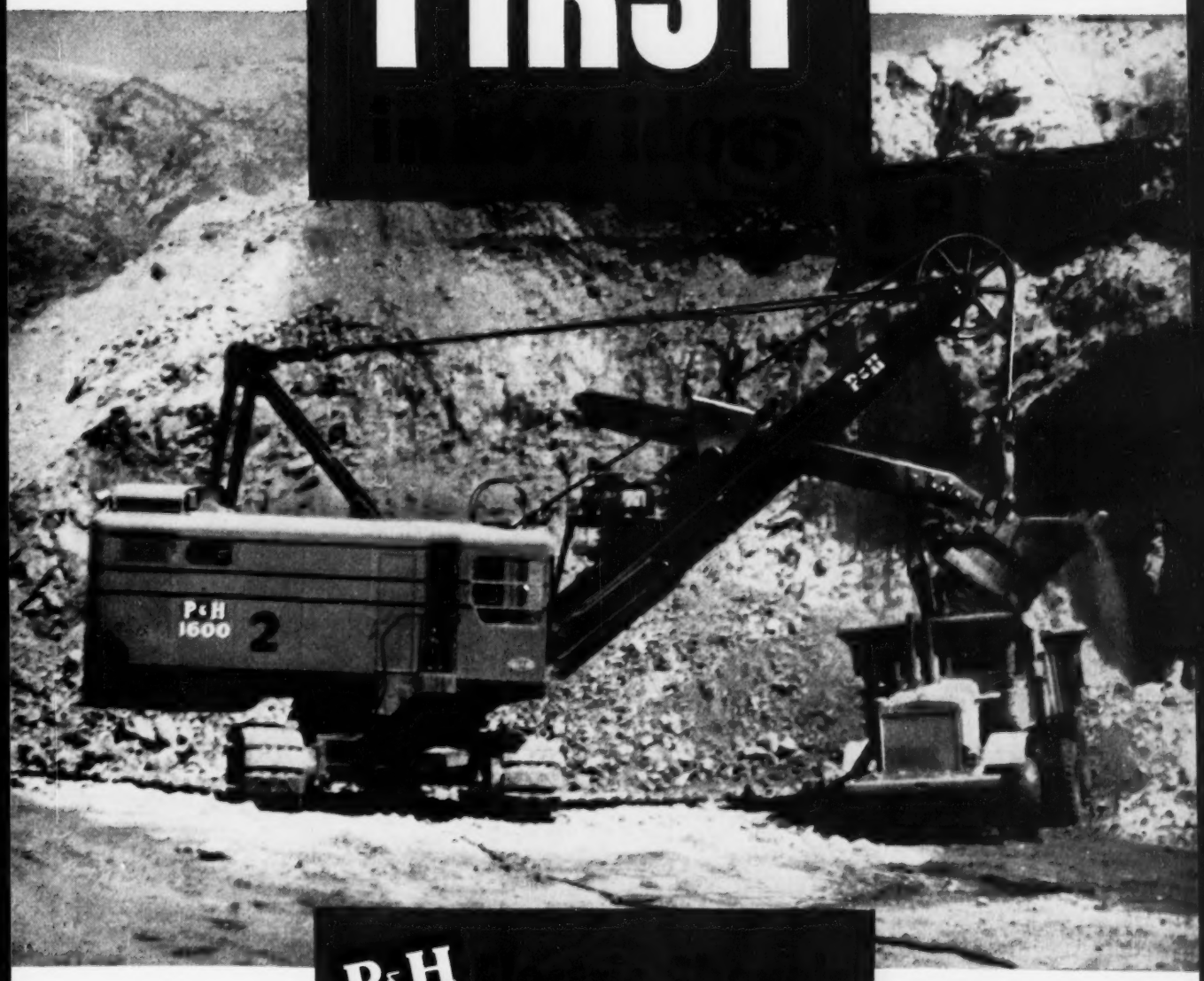

P&H

The first thing you see when you look into P&H Electric Shovels is new ideas—ways of doing things differently. *Differently and better!* For P&H engineering concentrates on one thing . . . cutting *your* production costs!

The result is evident in electrical equipment designed and built by P&H—especially for the purpose—not adapted for it. Stepless power regulation gives you the smoother flow of power without multiple contactors to cause trouble and replacements. There's Magnetorque* Hoist Drive, vertical swing motors, independent propel, powerful worm crowding mechanism with separate crowd motor, air-filtered cab. And there's the all-welded strength of rolled alloy steels to take year-in, year-out punishment.

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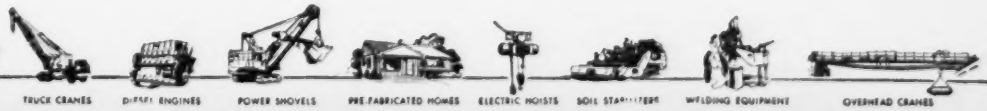


Consensus On AIME Annual Meeting— "Most Fun, Busiest Sessions, In Years"

JOHN B. HUTTL, R. H. RAMSEY

WHETHER IT WAS SUNSHINE in February or the Statler Hotel's color scheme (Scheme? it ought to be called a plot!), the fact is that the Annual Meeting of the AIME in Los Angeles, Feb. 16 to 19, left us just a little dizzy.

By our own admittedly unreliable count, there were at least 93 technical sessions, 21 committee or board meetings, and 21 special luncheons, dinners, or banquets. This does not include, of course, innumerable unofficial gatherings like the Cerro de Pasco alumni luncheon, the Old School get-togethers, and the serious discussions of politics and economics that went on in nooks thoughtfully provided here and there in the Statler by organizations too numerous to mention but very much appreciated.

Sorting themselves out among all this in a manner resembling the ordered confusion of New York's Long Island Railroad station at 5:15 on a Friday afternoon in July were well over 3,000 men and women. At the head of it all were Henry T. Mudd, Nicholas D'Arcy, Jr., Basil D. Kantzer, C. W. Six, Blair W. Stuart, who directed the general committee for the meeting, and Mrs. Harold J. Clark, chairman of the Women's Auxiliary activities.

Riffling through our notes on the convention, we have turned up these random jottings:

Something ought to be done about the static electricity and the "Shocking Pink" elevator doors in the Statler Hotel.

Those plush Hollywood dine-and-dance places (we only visited one) are frequented by some of the loveliest women and most lizard-like men we have ever seen.

How did Mr. Mudd's committee manage to roll back the famous Los Angeles smog so the sun could shine during the entire week of the meeting?

Television make-up, outside the studio, doesn't do a thing for one. At least it didn't for Cy Ruble, Sam Williston, and Felix Wormser.

It is a $3.50 cab ride from the Statler to the Beverly Hills Hotel. (We didn't go, but we helped a lady find out.)

Institute papers ought to be briefed, not read, especially when everyone in the audience already has a copy.

Politics in the Institute can be just as lively on occasion as they ever were in the old Third Ward back at home.

Lewis Douglas' comment at the Mining Division dinner that the U. S. ought to be friendlier to other nations started some hot discussions. Can a nation be "friendly" and still assume a firm leadership, was the question.

Everyone at that dinner, by the way, shared Don McLaughlin's pride and pleasure at the new arrival in his family.

All in all, we had a wonderful time; we met old friends we hadn't seen in years, although we never were able to finish a conversation with anybody; we learned a lot in the technical sessions. Our experience seems to have been typical.

Tariffs and Mining

In a session on the Paley Report, Arthur Bunker outlined once more the objectives of the Committee that prepared it. There still seems to be general disagreement in the industry on how seriously the Report should be taken and what ought to be done about it.

L. C. Raymond presented a tariff plan in an effort to meet both the Paley Report's objections to tariffs and the strong industry demand for them. He suggested the establishment of "free-import" quotas for commodities, with only excess imports paying tariffs.

C. J. Parkinson voiced objection to suggested changes in the public land laws, and Miles P. Romney gave a scholarly analysis of the defects of plans to stabilize metal markets by creating international "buffer stocks" of metals.

In another session, Messrs. C. C. Bailey, L. C. Raymond, and W. F. Boericke presented a paper on financing new mining ventures that's well worth reading.

Let us say right here that it is hopeless for us to attempt to report fully on the hundreds of technical papers presented at these sessions. We regret the necessity of omitting mention of many fine papers, but all we can do is single out, among those we were able to hear, the ones we found of greatest interest.

Rollin Farmin and Carville Sparks described use of wooden (red fir) roof bolts by Day Mines in Idaho. These are 1⅞-in. in diameter, 4 or 6 ft. long, wedged into a 2⅛-in. hole. They are cheaper than steel, better in soft ground, more resistant to corrosion; but nearby blasting may damage them, and they are inferior to steel for composite structures or hangers.

In the U. S. Gypsum mine, Heath, Mont., (Gerald C. Mathis), use of Joy loaders and shuttle cars in a program of mechanization has brought tons per man-shift from 0.9 in 1936 (hand-loading and mule-tramming) to 4.1 in 1952.

Carroll Weed described Inspiration's success in using an old caved block as an ore pass for open pit ore. Wheeled scrapers move the ore into the pass, whence it is trammed and hoisted as other underground ore. This saves an expensive haul over a ridge. This particular block was laid out and caved with its eventual use as an ore pass in mind.

Charles E. Schwab told about Bunker Hill's use of block caving in an orebody with a pronounced rake as well as a dip of 35 to 60 deg. The job is done by drawing from scrams located about 25 ft. from the ore footwall, and by locating these scrams in a stair-step pattern up the foot-wall.

Messrs. Stout and Wright told how Resurrection saved money by going from square-setting to a modified sublevel caving and top slicing system.

Milling and Metallurgy

F. F. Frick described Anaconda's leach-precipitation-float technique for the Greater Butte Project ores. The precipitant is sponge iron, which Anaconda makes as a minus 35-mesh, 50% iron, product of calcining at 1,850 deg. F. with 30% coal in a Bruckner furnace.

Fred Bond, of Allis-Chalmers, presented a tabulation of work indexes covering his hundreds of grindability tests on which he bases his Third Theory of Comminution. He is working steadily toward a means of accurately determining in advance the most efficient size of equipment to handle any given grinding or crushing problem.

Marston G. Fleming threw a spike into old theories of alkali depression of minerals by showing that no general theory is tenable. Alkali may depress galena by breaking up lead xanthate coatings, but it doesn't work that way on everything.

A whole session on centrifugal force in mineral dressing proves the increasing importance of that agent. Instrumentation rated an entire session, but as use of instruments grows, so does the need for men in mills who can understand, and maintain, them.

J. W. Byrkit, Phelps Dodge, presented some beautiful pictures of his new smelter at Ajo. Charging this furnace, using slingers, is about the simplest operation we've ever seen around a reverb.

IN MINING

Miami Copper to Open Low-Grade Ore Extension

HOWARD I. YOUNG, deputy administrator of DMPA has announced that a purchase contract has been signed with Miami Copper Co. for the production of 230-million lb. of refined copper from an orebody extending out from a deposit of higher-grade ore which the company has been working since 1906, and which is now nearing depletion.

Grade of ore in the undeveloped portion of the mine is low—only 10 lb. of recoverable copper per ton. Accordingly, DMPA has guaranteed Miami a 27.35¢ per lb. (f.o.b. Connecticut Valley points) price for copper from this new source. The company will spend an estimated $3-million to develop the orebody.

Production from the undeveloped Miami deposit is expected to start during the first six months of 1955. In addition to the 230-million lb. of copper, the deposit is expected to yield a considerable amount of molybdenum.

The contract runs to June 30, 1962, but the company reserves the right to cancel if the new project becomes a losing proposition and the losses reach a stipulated point.

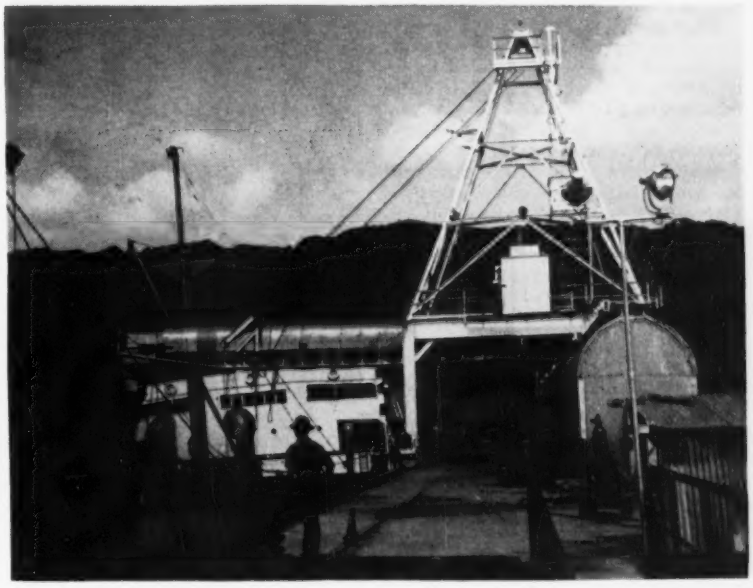
New Homogenous Reactor Produces Atomic Power

USEFUL AMOUNTS of electric power have been produced by a new type of reactor—an experimental homogenous reactor—at AEC's Oak Ridge National Laboratory recently. A pilot model of the reactor was put into operation to yield its full design power of 1,000 kw. of heat. Then the reactor steam was switched to a turbine generator which produced about 150 kw. of electricity.

In the homogenous reactor, a single homogenous solution serves as a fuel, moderator and coolant. Heat generated by the nuclear reaction of the solution is removed by pumping the hot radioactive liquid through a heat exchanger or boiler which produces steam for heat or power.

Nature of the homogenous liquid in the Oak Ridge reactor was not released, but it has been reported by AEC that the liquid in a early-type and quite dissimilar reactor at Los Alamos consisted of heavy water containing uranium salts in solution.

Union Carbide & Carbon Corp. operates the Oak Ridge National Laboratory for the AEC. Cost of research and development of the reactor was approximately $3-million; cost of the reactor, building, land site and auxiliaries was about $1-million.



SS EVANTHIA takes on a 10,000-ton load of bauxite at Port Kaiser, Jamaica, where Kaiser's new $12-million plant will yield 2-million tons of bauxite yearly.

Kaiser Starts Shipping Bauxite from Jamaica

KAISER ALUMINUM & CHEMICAL CORP. formally opened its $12-million bauxite mining operations in Jamaica on Feb. 11, when the first 10,000-ton shipment of ore was loaded on the SS Evanthia which sailed to Kaiser Aluminum's Baton Rouge, La., processing plant.

Operated by Kaiser Bauxite Co., the new property will have an annual capacity of about 2-million tons. Approximately 19,000 acres of bauxite reserves have been acquired, and these will be sufficient to supply Kaiser's expanded operations for 50 years.

Primary facilities are located near the southwest coast of St. Elizabeth Parish. The bauxite is mined by open-pit methods, and hauled by diesel locomotives over a 13-mi. private standard-gage railroad to ore handling drying, and storage facilities at Port Kaiser at Little Pedro Point.

A conveyor belt system automatically loads ore ships anchored at a steel and concrete pier extending 995 ft. from shore.

Before being shipped, the ore is stockpiled, then fed to two 10x80-ft. rotary driers, and finally stored in a 250x160-ft. building capable of holding 32,000 tons.

Cost of the Jamaica project is about $12-million. This is part of Kaiser's current $200-million privately-financed expansion program which aims to increase primary aluminum capacity to more than 800-million lb. a year, and boost production of fabricated products.

Cyprus-Utah's Marcona Iron Mine in Peru To Yield 200,000 Tons a Month

FIRST PRODUCTION IN APRIL and capacity output of 200,000 tons a month by June have been scheduled for the Peruvian iron-mining venture being undertaken jointly by Cyprus Mines Corp. and Utah Construction Co. Development, started only late in January, is in the hands of labor imported from the U. S. The capacity production figure is shipment ore screened at the minesite to eliminate fines and desert sand that covers the outcrop in drifts up to a depth of 10 meters.

Under construction are a dock at the port of San Juan, a two-lane paved road from port to the minesite 10 mi. away, an assay laboratory, truck and tire-maintenance shops, and housing for about 500 employees, who will be recruited as far as possible from the mine vicinity.

The entire operation will be highly mechanized. Stockpiles will be dumped

Cyprus-Utah *(Continued)*

onto conveyors running through tunnels and carried to San Juan by a fleet of about twenty 65-ton trucks for shipment to eastern U. S. ports.

The deposit, at least 20-million tons of ore, chiefly hematite and magnetite with some limonite, is situated in extremely arid desert at 1,500 to 2,000 ft. above sea-level. Ore occurs at the surface, and open-pit mining will be carried on from the outset. Elimination of sand from the drifts by screening precludes the need of a clean stripping job.

Marcona Mining Co., owned jointly by Cyprus and Utah, will conduct the enterprise from offices at Utah's address, 1 Montgomery St., San Francisco.

U.S. Buys 230,500 Tons of Mexican Manganese Ore

SIGNING OF FOUR CONTRACTS which call for delivery to the United States of 230,500 tons of manganese ore from 30 to 40 small Mexican mines was announced March 6 by Howard I. Young, deputy administrator of the Defense Materials Procurement Agency. This project is part of a larger program aimed at developing sources of supply on this continent.

The government's program calls for a total of 550,000 tons of Mexican ore to be delivered over the next three years at a depot at El Paso, Tex., for processing. To date, the DMPA has signed up for 280,500 tons, with the remaining 269,500 tons under negotiation.

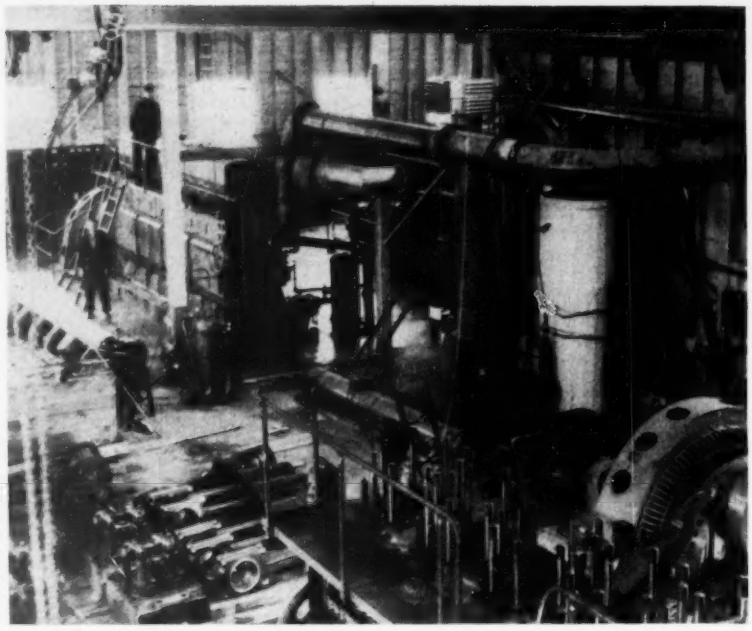
DMPA plans to negotiate with a private concern for the construction and operation of a processing plant at El Paso.

The contracts announced last week are with these firms: Winter, Wolff & Co., New York; Frank Samuel & Co., Philadelphia; Continental Ore Corp., New York, and Industrial Development Corporation de Mexico, S. A., San Luis Potosi, Mexico. A contract for 50,000 tons was closed previously with Manganese Producers, of El Paso.

When the entire project is under way, ore will be coming from 60 to 100 mines, employing upwards of 2,000 Mexican miners.

The price to the Government under the most recent contracts will be $19.30 per long ton for 25% ore (equivalent to 77.2¢ per long ton unit), f.o.b. freight cars at the depot, with a premium of 70¢ per ton for each 1% of manganese content above 25% and a penalty of $1 per ton for each 1% below 25%, down to and including 20%. Ore containing less than 20% manganese or more than 20% silica will not be accepted.

Mines as far as 1,000 mi. below the border are involved in the program. The ore will come from four states in Mexico—Chihuahua, Durango, Zacatecas and San Luis Potosi.



HEAVY WATER FLOWS call for total of 6,200 kw. installed diesel engine power, shown here being erected in Eureka Corp., Ltd's. plant.

New Attack on Fad Shaft Water Means More Power for Pumps

E. J. WATTS, Worthington Corp., Salt Lake City, Utah

THE MAJOR UNWATERING JOB faced by Eureka Corp., Ltd., at the Fad Shaft, Eureka, Nev., is now underway. Shut down since December 1948, when they were drowned out by a flow of water running at times over 15,000 gpm., the pumps are going again, backed this time by a diesel-electric power plant big enough to handle the prospective load.

Aimed at one of the most promising lead-zinc orebodies in the West, the Fad shaft was started in 1945, following drill-hole discoveries of ore in exploration conducted between 1940 and 1944. Site of the shaft is in the Eureka District, an old-time lead-silver producer with over $51-million to its credit. The mine is 77 mi. from the nearest railroad and over 7,000 ft. above sea level.

To furnish power for shaft-sinking, and for subsequent mining and milling operations, it was decided to use diesel engines. Because power was required at once, three used McIntosh-Seymour, 460-hp., 300-rpm engines were purchased.

As work progressed on the four-compartment Fad Shaft, considerable water was encountered and additional power was required. The first Worthington 8-cylinder, 16 x 20, vertical, four-cycle, direct injection, turbo-charged diesel engine was installed early in 1947 as a result of this power need. This engine is direct connected to a 1,000 kw., 2,400-v., 360-rpm, G. E. synchronous generator.

Soon after the first engine was installed, a duplicate unit was purchased, and late in the fall of 1947 a third Worthington engine was ordered.

As the shaft deepened and more water was encountered, the need for additional power again became urgent. Four used engines totaling 2,800 kw. and several small used units totaling 500 kw. were obtained to meet the emergency.

At the peak of this phase of the operation a total of 6,975 kw. in diesel engines was installed and running.

The heavy flow of water continued from the spring of 1948 to early December of the same year with no apparent reduction in quantity in sight.

Finally, in December of 1948, the management decided to discontinue all operations because of the excessive flow of water, and to plan another approach to the unwatering job.

A New Start

During the following two years, a study of the water problem was made by company engineers with the advice of several consultants, and it has been decided that steady pumping over a relatively long period of time is the best method of attack. It has been

FAGERGREN'S INCREASED FLOTATION RECOVERY PROVED BY COMPARATIVE TESTS

TEST DATA

The increased metal and economic recovery of the Fagergrens is shown in cents per ton of mill heads. Cell volume ratios are total cubic feet of cell volume in the Fagergren test machines versus cubic feet in competing machines handling the same feed rate.

CELL VOLUME RATIOS (Fagergrens to competing units)	METAL RECOVERY (Fagergrens over competing units)	ECONOMIC RECOVERY (Fagergrens over competing units)
1 to 1.8	+ 2c ton	+ 2½c ton
1 to 1.66	+ 2⅔c ton	+ 3c ton
1 to 1.07	+ 6⅔c ton	+ 6c ton

These are actual results of an extensive test program recently concluded by a progressive mining company seeking to determine the best all around flotation machines to be installed in their plant. The tests conclusively proved Fagergren superiority in terms of *lower tailing losses, higher concentrate grade, lower reagent costs,* and *lower smelting charges.* These added up to a substantial dollars and cents advantage in both metal and overall recoveries.

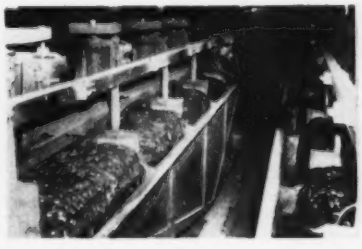
Proof that higher speed of float pays off

These tests and other related data conclusively demonstrate that Fagergrens achieve higher recovery with less cell volume. Note that even with 80% more cell volume, the other machines could not match the recovery of the Fagergrens. Furthermore as the ratio of cell volumes was reduced, the Fagergrens' margin of recovery increased still further.

Greater throughput capacity per cubic foot is the direct result of the faster rate of flotation achieved by Fagergren's exclusive rotor-stator principle. This powerful agitating mechanism provides an unmatched efficiency of pulp aeration and dispersion.

To the Fagergren's gains in metal and economic recovery shown in the above data, the fact that fewer cubic feet of machine are required adds these further savings — lower installation costs, reduced floor space, less operating labor, etc.

WRITE TODAY for consultation on your specific flotation problems and for free descriptive literature on Fagergren machines.



Typical installations of Fagergren Flotation Machines.

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Eimco Geared Air Motors are husky, powerful units built to work on a continuous operating basis with a minimum of attention.

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Power units are Eimco 5 cylinder, radial-type, reversible air motors. These motors have a high starting torque and work efficiently on pressures from 40 to 125 p. s. i.

Eimco Geared Units are available in three sizes, conservatively rated at between 7½ to 17 h.p., each with four different speed ratios.

Eimco Geared Air Motors are the only completely safe, completely dependable units.
Write for Bulletin AE6001.

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Fad Shaft *(Continued)*

estimated that it will require approximately two to three years to unwater the mine to the 2250 level.

The permanent power plant now consists of the three Worthington SEH-8 engines, with two new Worthington SEH-8 engines equipped with aftercoolers and vapor phase cooling, installed this fall. The new engines are rated at 1240 kw. each at 7,000 ft. elevation.

The Worthington engines installed first are cooled by means of Worthington evaporative coolers, two per engine, one cooler for jacket water and the other for lubricating oil temperature control. A waste heat boiler is installed in the exhaust gas line of the No. 1 Worthington, which furnishes steam for heating the machine shop, hoist house, and change house. No auxiliary heat is required in the power plant building.

Demand is Severe

Under normal operating conditions, the demand for power is fluctuating and severe. Eight hundred to 1,000 kw. may be demanded instantaneously and just as suddenly dropped.

The No. 1 Worthington engine during its first year of operation was on the line continuously for 8,000 hours with only 10 hours down time for spot checks. When this engine was taken off the line for a complete inspection, it was found to be in excellent condition. A few minor adjustments and replacements were made, a new set of rings installed, and the engine was again placed in service.

Calol-65 straight mineral oil is used for lubricating the engines. The fuel oil, as well as the lubricating oil, is furnished by Standard Oil of California.

Fuel oil is supplied directly to all engines from storage tanks located on a hill above the power plant. The fuel oil pressure at the engine is approximately 5 lb.

Due to transportation limitations, each of the Worthington engines was dismantled at the factory to a minimum weight of the heaviest piece , approximately 25 tons. The dismantled engines were then hauled by truck from the railroad to the plant site.

Acknowledgment

George W. Mitchell, vice president of Eureka Corporation, Ltd., has directed all work at the property since activities started in 1945.

We extend our thanks to him for permission to write this article.

On the mine staff is: Vernon A. Manz, mine superintendent; Tom Kelley, master mechanic; J. D. Morrison, Jr., chief operator of the power plant; and A. J. O'Connell, chief accountant.

German, and Czech Groups Bid for Bolivian Minerals

EUROPEAN NATIONS on both sides of the Iron Curtain are making bids for Bolivian strategic materials in exchange for services and manufactured items. Sr. Isaac Guzman Pabon, Bolivian miner who recently returned from the Soviet "Peace Conference" in Vienna, told the Bolivian press that a delegation of Czech officials had proposed an exchange of Bolivian tin, copper, cobalt, lead, nickel, wolfram, molybdenum and mica for industrial machinery, textiles, manufactured goods, porcelain goods, diesel equipment, drilling machinery, hydro-electric machinery, and engineering instruments, to be supplied by the Czech Government.

"In my opinion," said Sr. Guzman Pabon, "the most interesting offer of the Czech Government is the erection of a smelter in Bolivia."

Herr Roland Oeherli, representative of the "Geber Paprotka" Hamburg concern, handed a note to the Bolivian Finance Minister in February stating that his firm is ready to extend to Bolivia a credit for $200-million worth of textiles, machinery, chemicals and other goods. In return, West Germany would require metals, minerals, leather, furs, and other raw materials on a sort of barter basis.

In February, a representative of H. F. Gordey, West Germany, sent a note to Juan Lechin, Bolivian minister of mines, proposing the following: (1) The sales of 20,000 tons of Bolivian tin concentrates to Gordey, payment to be 50% in U. S. dollars, and the balance in machinery for mining and food processing. (2) The export of tin concentrates to Germany for smelting with provisions that Bolivia could request tin and terne plate in return.

A third news report out of Bolivia indicated that a German mission was on its way to make proposals for the erection of a smelter, petroleum refinery, sulphuric acid plant, sugar refinery. Initial capital outlay was reported to be $50-million (U. S.). Plans involved capital from Germany, Bolivia, and Brazil, and one of the objectives of the proposed group was said to be the development of uranium, columbite, and iron deposits near the Brazilian-Bolivian border.

$14-Million Loan to Aid Rhodesian Rail Expansion

THE INTERNATIONAL BANK for Reconstruction and Development has made a $14-million loan to Northern Rhodesia which will be applied to a $79-million three-year project to expand existing rail facilities in. A 200-mi. railway line from Bannockburn, Southern Rhodesia, to Mozambique will connect with a line now being built by the Portugese Government to the port of Lourenco Marques.

In 1951 ECA made a $14-million loan to the Rhodesians to start this rail expansion program. The Rhodesian

area is one of the world's important mineral producer, and last year accounted for about 14% of the Free World's copper production.

New Park Mining Uses Novel Incentive Plan

NEW PARK MINING CO., sole producer presently active in the Park City district, is now using a new incentive program for its 150 miners through which they reportedly can gain 25% of new profits from gross ore sales. Clark L. Wilson, general manager, said March 2 that the program effectively ties in the price of metals (mainly lead and zinc), tonnage production, grade of ore mined, and prevention of waste. The incentive pay program, a radical departure from past wage plans, is said by Mr. Wilson to make miners more conscious of the fluctuations and instability of metal prices, and aims at increasing more efficient operation. The plan gained the warm praise of George F. Lee, vice president, Local 4292, United Steel Workers of America, CIO.

AEC Uranium Bonuses Total $1.46-Million

BONUSES TOTALING $1,459,126 have been paid to uranium miners for initial production of uranium since the bonus program was put into effect Mar. 1, 1951, according to the manager of Grand Junction operations, Division of Raw Materials of the Atomic Energy Commission.

Under the bonus program, payments are made to producers on that part of the first 10,000 lb. of uranium oxide in acceptable ore delivered to qualified mills or ore-buying stations between March 1, 1951 and Feb. 28, 1954. Bonus payments apply to uranium ore produced from new mines or from mines which had not delivered 10,000 lb. of uranium oxide prior to March 1, 1951.

Bonus payments are now being paid at the rate of more than $200,000 per month. (See E&MJ January 1952, page 81 for a graph showing how this production bonus value is determined.)

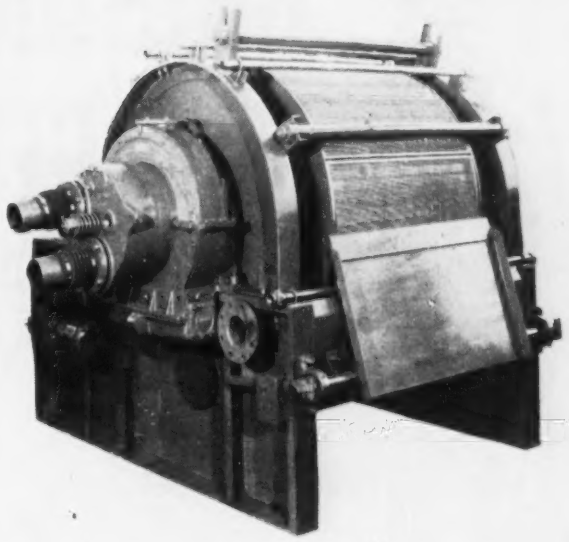
British Look for Cheaper Copper Under Decontrol

DESPITE the strong situation in domestic "underpriced" copper and some talk of higher prices in Chile, sentiment in British copper circles remains bearish for the long pull. Continental observers share this view.

In commenting on the outlook, the *Financial Times* of London, recently said:

"The decision of the International Materials Conference to discontinue the international allocation of copper has this significance for the U.K.; it means that the first obstacle to a

NEW VACUUM FILTERS FOR NEW PROCESSES



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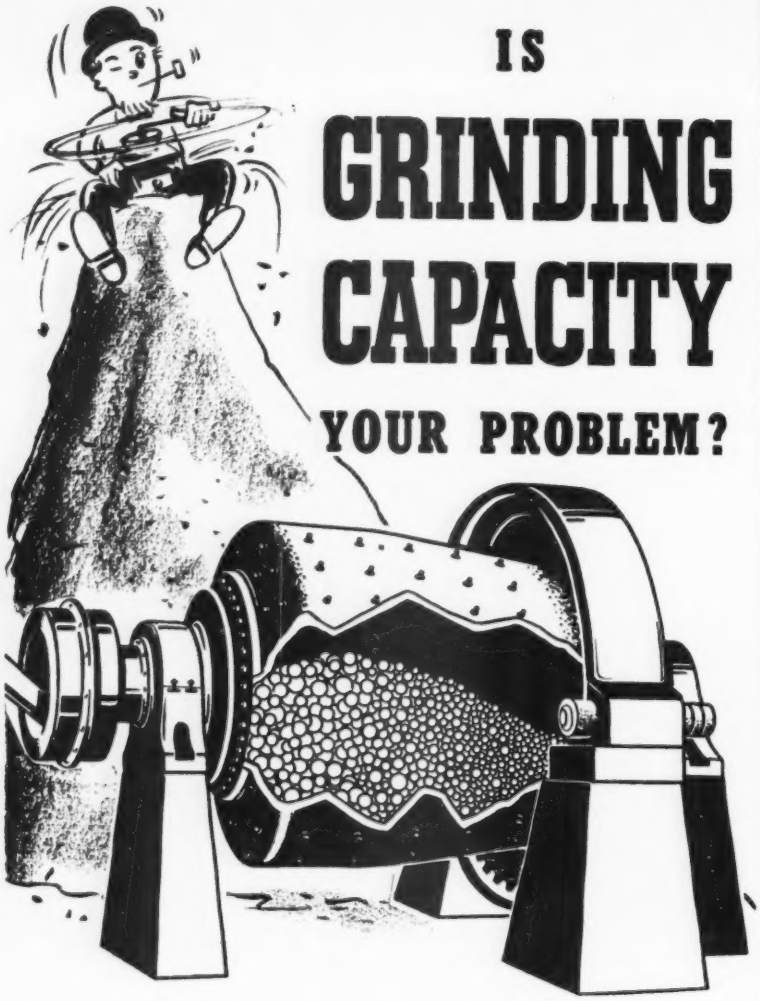

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GRINDING CAPACITY

YOUR PROBLEM?

HARDINGE TRICONE MILLS

Here are some of the reasons why the Hardinge Tricone Mill is more efficient than other mills:

1. The tapered barrel causes correct ball alignment. Grinding energy is conserved thereby. Ball consumption is reduced, the big fellows are kept away from the little ones.
2. The Tricone Mill occupies less floor space for a given grinding volume than any other type of mill ever built.
3. New design bearings reduce friction and cut over-all power consumption about 5%.
4. When crowded for more capacity, a grate is added, at a proportionate increase in power, but with this type of grate mill, the larger balls are kept at the feed end, and only smaller balls are in contact with the grate, which minimizes wear.
5. Tapered ends reduce end friction, as is evidenced by lower liner consumption and power.
6. Ideal for large tonnages.

Write for Bulletin AH-414-1

HARDINGE

Cheaper Copper *(Continued)*

restoration of freedom to the copper market here has been removed. So long as the allocations were continued free dealings in copper could hardly be achieved, even though to many people in this country the present statistical position of the metal has for some months past seemed to justify taking such a step. Furthermore, the I.M.C.'s action is a confirmation of the fact that world supplies of copper are now more adequate to meet demand than they have been at any time since the war.

"To some extent also, the I.M.C. decision probably reflects the attitude of the new Administration in the U.S. to controls generally. There are reports in the U.S. that domestic copper ceiling prices will be removed or altered before April 30—when all controls are due to expire—despite the fact that the demand for copper there remains very strong. This demand is partly due to the continuing heavy needs of industry and defense, but it also reflects the expectations of buyers that prices may be moving up shortly.

"It has been reported that the Chilean Government, which now markets at a substantial profit the copper produced by the American mines in that country, is considering an increase in its price—perhaps by as much as 3½ cents—on world market sales. If this is, in fact, the Chilean Government's intention, it may be prompted by the expectation that the removal of controls in the U.S. will send up the domestic price. This may well happen. But the removal of controls in the U.S., a higher domestic price, and the end of I.M.C. allocations may be the best reply to the Chilean demands.

"If the U.S. domestic price goes up the position of Chile in world markets may be less dominant. There is no doubt that the metal is over-valued at present as a result of the attitude of Chile. Free dealings in London would probably bring cheaper copper to consumers in the U.K. and the supply of sterling area copper is now such that there should be no loss of dollars as a result."

Iron Ores to Yield By-Product Sulphur

EIGHTY-SEVEN PER CENT recovery of sulphur and promising by-product values in iron were obtained from flotation tests on iron sulphide ores of Minnesota's Aitkin and Carlton counties, it's announced in a Bureau of Mines report released by Interior Secretary Douglas McKay. The report said it could be inferred from the relatively low silica content of the concentrate that a high iron residue results from roasting for sulphuric acid production.

Fine dissemination of sulphides in the gangue prevented rejection of low-sulphur gangue minerals by sink-float.

IN THE U.S.

ALABAMA

★Tennessee Coal and Iron Division of U.S. Steel expects to import between 300,000 and 400,000 tons of iron ore monthly through the port at Mobile, Ala., according to M. H. Geisking, assistant to the president. The terminal, is now under construction on the site of the old Turner Terminal.

ARIZONA

★**Magma Copper Corp.** has purchased properties of the St. Anthony Mining Development Co., Ltd., adjacent to Magma's new San Manuel copper mine in southeastern Pinal County. St. Anthony lead and zinc operations were closed in November because of price decline and rising water at the 125-ft. level. The St. Anthony property is adjacent to the new $114-million Magma copper project. W. P. Goss, Magma manager, said the company has no plans at present to reopen the St. Anthony development which was acquired for 10,000 shares of Magma common stock. In nearly 70 years of operation, the St. Anthony mine produced $40-million worth of ore.

★**Coronado Copper & Zinc Co.** (Pima County near Benson, Fred E. Gray, superintendent) is operating from a new shaft with drifts at the 5-, 6-, and 700-ft. levels. From 25 to 28 cars of copper and zinc concentrates are being shipped monthly with total output averaging 1,750 tons. The mine closed its old Republic shaft several months ago.

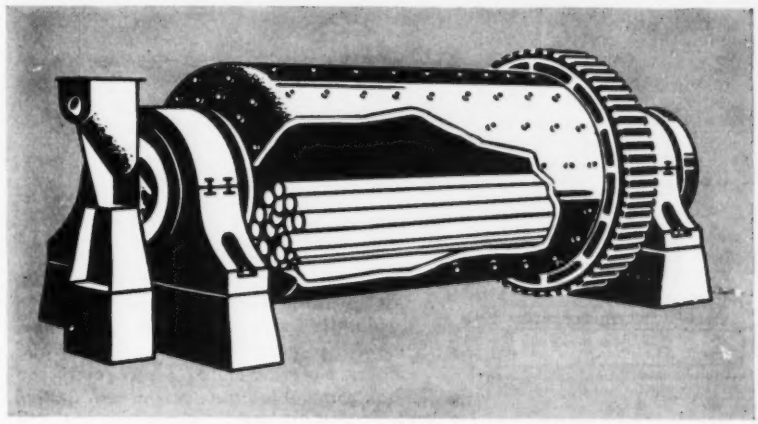
★Production is expected to start in the first half of 1955 on **Miami Copper Co.** low grade deposits in Gila County. The company has signed an agreement to produce 230-million lb. on a guaranteed government price of 27.85¢ a lb. The copper to be produced from an undeveloped orebody extending out from an underground deposit of higher grade ore in the Miami-Globe district. The company has been working the deposit since 1906.

Ore in the undeveloped portion is low, and extension of the operation after exhaustion of the higher-grade ore would be impossible. The company will develop the new orebody at its own expense—estimated at $3-million.

★**Globe-Miami Copper Zinc Corp.** is deepening the Comstock Property Irene shaft to 800 ft. and driving new drifts to an orebody located previously through drilling. The $63,750 development carries a $31,875 federal assist.

★**Arizona needs legislation** empowering it to reserve in its own name any rights to mineral resources, including petroleum, that may be discovered on state-owned land sold into private ownership, State Attorney General Ross F. Jones has advised the legislature.

IS SIZE REDUCTION YOUR PROBLEM?



HARDINGE ROD MILLS

Hardinge's bulletin on Rod Mills answers the question—"What Happens Inside a Rod Mill?"—and shows how Hardinge Rod Mills solve some of the usual problems.

- Hardinge Rod Mills efficiently prepare products in the 6-mesh to 20-mesh range in open circuit, both wet and dry grinding.
- When used in closed circuit producing similar, closely sized products, performance compares favorably with best obtainable by other means.
- Conical heads in Hardinge Rod Mills reduce friction, prevent congestion of charge at the ends, and align the rods.
- Hardinge Rod Mills are built in sizes from 2' to 11½' diameter in variable lengths for the job to be done.
- Hardinge Rod Mills are built with either end, or center, peripheral discharge, or with trunnion overflow.

Write for Bulletin 25-C-1.

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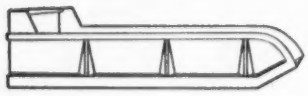
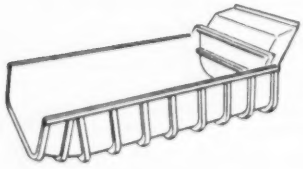


MODEL 310: Scoop end mucker body for use with St.Paul Hi-Dumper hoists. Extra pay-load capacity, dumping angles up to 75°.



MODEL 311: Heavy-duty rock-type body with scoop end for fast, easy dumping of big payloads on mine or quarry operations.

There's a "*difference*" in dump bodies! And St.Paul *proves it*, with this completely new heavy-duty line, newly engineered for *extra payload hours*. Note the sturdy 3-way reinforced box channel tail gate on the new St.Paul contractor's body, (shown above). It's built stronger, tougher, to withstand roughest usage, without warping or binding. Improved design of offset upper hinges and recessed lower hinges also means added hours of smooth, trouble-free operation on your job.

And look at those *massive boxed steel side braces*, with double-rolled top flanges and full-length rub-rails! They're plenty rugged! In addition, you get *rigid boxed corner posts* with unitized, "sag-proof" subframe for extra-long service. Call your truck dealer, or St.Paul Distributor today for full details on sizes, styles, etc. to fit your needs. St.Paul Hydraulic Hoist Customer Service Dept. 36121 Main St., Wayne, Mich.

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CALIFORNIA

★**El Dorado Chrome Co.** plans to process 200 tons of chrome ore daily with about 40 tons of concentrates for shipment at its Shingle Springs property, El Dorado County. The company will utilize the old Church mine mill to process the chrome and will also operate the Church mine itself, which is primarily a gold property. Chrome ore will be hauled from the Chaix, Murphy, Cornelius and other properties in the area.

★At the **Pilliken chrome** mine in Negro Hill district, El Dorado County, Allied Mining Co. is constructing a 100-ton concentration plant. The company has also arranged to lease a mill on the property. When both plants are in operation the company expects to process 200 tons of milling grade chromite daily and ship concentrates to Grants Pass.

Under former operation in 1940, when Rustless Mining Corp. of Baltimore, leased the property from U. S. Chrome Mines, Inc., production was about 100 tons of concentrates weekly. About 23 men are now at work on the property engaged in surface mining. Walter Hoppe and Ray Graetz of Auburn, Calif., have been working the mine.

★A new iron ore development has been started by **Mineral Materials Co.**, of Alhambra, Calif., at a site in the south end of Death Valley near Baker. Mineral Materials has transferred about 22 men from its Lovelock, Nev., site to the new operation.

Iron ore shipment from the Nevada operation has been curtailed until April 1; however, exploratory and development work will be continued with some equipment left.

★**Central Eureka Corp.**, of San Jose, Calif., has suspended operation at the company's Sutter Creek, Amador County mine temporarily to rebuild two shafts. About 60 miners and muckers were laid off temporarily; 90 repair, maintenance, hoist shaft and pump men will remain on the job. The company is also investigating ways of boosting the daily output to 350 tons daily.

★**Bethlehem Steel Corp.** has acquired a 5-year lease on four iron claims north of Lake Bowman, 41 mi. northeast of Grass Valley, Nevada County. The corporation plans to ship the ore to its Pennsylvania mills and smelters via Stockton. Deposits are estimated to contain more than 1-million tons of commercial grade iron ore. Mining will be conducted in open pits with power shovels and the company plans to ship more than 500 tons of ore per month during the early phase of the project.

★**The Penn Mine** of New Penn Mines, Inc. discontinued zinc mining operations on January 20, because of ore exhaustion and low metal prices. California's mine production of recoverable zinc was 480 tons in January 1953.

COLORADO

★**A treatment developed by Andy Sweet for upgrading tungsten concentrates** will be applied commercially for the first time when Sweet and his two sons complete the tungsten mill and treatment plant now going up in Summit County. One source of ore will be Tom Jackson's development at the head of the Blue River, temporarily idle, but awaiting only completion of the Sweet plant before resuming operations. Sweet said that, if his process proves a success, the upgraded concentrates probably would be shipped to the Montezuma refinery.

★Al Roseler and C. P. Heckler have put down the shaft of their gold mine, adjacent to the Poorman mine in Four Mile Canyon, Boulder County, 100 ft. and drifted westerly 30 ft. to investigate a flat vein that appears at the surface. **The formation resembles those that gave rich ore in the Poorman mine.**

★**Pandora Metals, Inc.**, is sinking a winze in its mine in Boulder County's Caribou district an additional 400 ft. from the 450 and will build a 50-ton underground flotation mill to upgrade silver-lead-zinc ore the year-round. (E. T. Blakesley, manager, has offices at 1555 Dayton St., Aurora Station, Denver.)

★Central City merchants have formed **Central City Milling & Mining Corp.** to handle local ores in a 50-ton selective flotation gravity-feed ball mill in Gilpin County on a custom basis. The company plans also to lease and mine orebodies east of the Eureka shaft at Prosser Gulch, where the mill will be located. Van McKay will serve as secretary-treasurer and manager.

★**U. S. Metals Corp.** has struck copper ore in the Henrietta vein of the Henrietta mine near Silverton, and a combine (Joe Trudgeon, production superintendent) composed of the same men who control U. S. Metals and **Falk Metals Corp.**, are claiming a new zinc discovery in the Hercules mine.

★Merrill E. Shoup, president, reported at **Golden Cycle Corp.'s** annual meeting in Colorado Springs that the company's Ajax gold mine in the Cripple Creek district produced 22,000 tons of ore in the past year, averaging $40 a ton. Max Bowen, manager, said Golden Cycle's mill is currently treating about 800 tons of ore a day.

★Although production of zinc concentrates was off more than 1,000 tons a month in 1952 compared to output in the year previous, F. J. Maloit, general superintendent of Empire Zinc Division, **New Jersey Zinc Co.**, was able to report continuous operation of the division's Eagle mine and underground mill at Gilman throughout last year.

★Conrad H. Smith and Francis Reed are taking **ore averaging about 1% tungsten** out of the Quaker mine at the Gordon Gulch road level in Boul-

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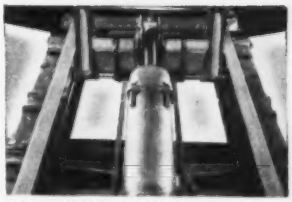
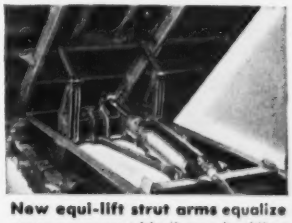


New sliding tension bars absorb shock loads, avoid danger of cracking side rails or chassis frame.



New equi-lift strut arms equalize stresses, prevent binding or buckling from uneven load conditions.

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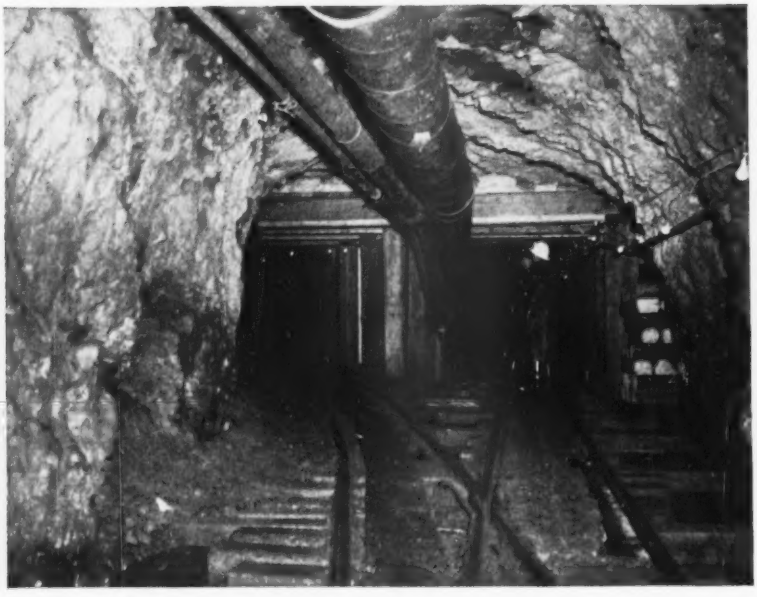

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Colorado *(Continued)*

der County and driving on the Hildegarde vein for an old shaft on the hillside.

★Low metal prices and high operating costs have forced **The King Lease, Inc.,** to curtail operations of its Camp Bird mine.

★Shutdown of **Shenandoah-Dives** mine and mill, which employed about 150, was also attributed to the poor market for metals in announcement of the news made by Chief Clerk Edward Larson. Stoppage at the mill apparently condemns several small mines hereabouts that had been selling their ore to Shenandoah. These employed a total of about 40 men.

★Predictions here following the 56th annual convention of Colorado Mining Association at Denver envisage **doubling of the nation's metals production,** should the GOP Administration adopt policies advocated at the convention, and relative independence from the metals imports on which the former administration relied so heavily.

IDAHO

★Impelled by the high antimony content of its silver ores and increased smelting costs, **Sunshine Mining Co.** is reactivating its antimony plant to process high-grade tetrahedrite concentrates. The antimony is dissolved in a hot sodium sulphide solution and recovered electrolytically as a granular cathode antimony.

★Additional curtailment of mining operations in response to depressed metal prices has been announced recently by three Idaho firms.

Bunker Hill & Sullivan Mining and Concentrating Co. quit block-caving and jig-tailing, laying off about 150 and reducing ore output from 3,000 to 1,200 tons a day. Only square-set mining is being conducted now.

Day Mines, Inc., laid off a number of men in closing down some marginal stopes in its Tamarack mine northeast of Wallace. The mine is primarily a zinc producer.

Clayton Silver Mines (Norman M. Smith, of Kellogg, directing engineer) restricted underground work to preparations to open a new 550 level. Clayton will continue to mill broken ore from above the 400 level.

★**Whitedelf Mining and Development Co.,** having completed deepening the main shaft of its mine near Clark Fork from the 400 to the 800 level, was ready to explore an area on the lower horizon where Bureau of Mines diamond-drilling indicated 3.5-ft. width in silver-lead ore.

★**Coeur d'Alene Mines Corp.** stockholders sanctioned an agreement whereby **Polaris Mining Co.** would develop Coeur d'Alene's property in the

(Continued on page 143)

Coming to you

in July E&MJ

"Mining's Greatest Era"

A PANORAMA OF MINING'S GREATEST EXPANSION PROGRAM

IN THIS ONE ISSUE OF E&MJ you will find:

- The inspiring story of the plans of a great industry as it moves forward to meet the increasing mineral needs of the world
- What this vast expansion might mean to you and your job
- Where the minerals for tomorrow are coming from
- How they will be mined
- How they will be concentrated and refined
- What new equipment will be needed

You will refer to the July issue of ENGINEERING AND MINING JOURNAL for years to come

Engineering & Mining will present in July

WHY THE JULY ISSUE "MINING'S GREATEST ERA" IS BEING PUBLISHED

Industry through the world, both civilian and military, is demanding an ever-growing variety and quantity of mineral raw materials. Even conservative estimates of future demands for most metals and minerals fall far beyond the capacity of today's mining industry to supply.

WHAT THE JULY ISSUE OF E & M J WILL CONTAIN

1 An authoritative analysis of the outlook for the big-production minerals and metals like copper, aluminum, iron ore, lead, zinc, and potash. This will make clear why your industry's expansion programs are essential, and why they must go ahead despite short-term fluctuations in the price of metals.

A separate article in this section will deal with the special problems of small mines in the expansion programs ahead.

YOU WILL REFER TO THE JULY ISSUE

Journal "Mining's Greatest Era"

Therefore, the mining industry, aided in many instances by government, is launching new expansion projects in every quarter of the free world. New investment in these projects, on a scale never approached in the industry's history, is climbing into the billions of dollars.

In your own interest, and to make your best contribution to your industry's future, you should have full appreciation of the scope and direction of this vast expansion and what it might mean to you and your job.

2 A comprehensive survey of the future for mining in terms of the rising usefulness of the "new" metals like germanium, cobalt, titanium, uranium. This section will also deal with the question of substitution of one metal for another, and what effect such substitutions may have on the structure of our industry.

3 An authoritative, graphic, pictorial panorama of the tremendous expansion programs now being carried forward or being planned by mining companies everywhere. This section will give you a new, and welcome, conception of your industry as a great and growing power in the free world's future.

For a revealing picture of growth in your industry, turn to the next page. This is the raw material for the July issue of E&MJ, "Mining's Greatest Era."

MINING ENTERS ITS GREATEST ERA

SOME OF THE NEW EXPANSION PROJECTS IN THE NEWS

IRON ORE

United States

Erie Mining Co. expects to begin work on its 10½-million-ton, $298-million commercial beneficiation project on Lake Superior, based on present 200,000-ton, $2-million pilot plant at Aurora, Minn.

Reserve Mining Co., with a $7½-million, 300,000-ton preliminary plant at Babbitt, Minnesota in operation, is now building railroad, docks and townsite for $160-million 3¾-million-ton commercial-scale plant near Beaver Bay. Eventually this will have 10-million-ton capacity.

Oliver Iron Mining Div., U.S. Steel Corp., is completing new half-million-ton pilot plant at Mountain Iron, Minn. This, with 1-million-ton experimental agglomeration plant at Virginia, added up to a $17-20-million appropriation.

Cleveland-Cliffs Iron Co. and Ford Motor Co. jointly are building 400,000-ton plant at Humboldt, Mich. to beneficiate iron-bearing jasper. Investment not announced, but at $30 per annual ton of finished product it should be about $12-million.

Oliver Iron Mining Division, U. S. Steel Corp., plans a $60-million ore screening and sintering plant at Two Harbors, Minnesota to agglomerate fine ore before shipment.

Foreign

Steep Rock Iron Mines, Ltd., Ontario, plans to boost its output to 3½-million tons per year in 1954 and to 6- to 9-million eventually. Indicated overall development cost, including future expansion, will approach $10 per annual ton.

Inland Steel Co. plans to spend $50-million in developing iron orebody containing over 50-million tons in ground leased from Steep Rock Iron Mines, Ltd.

Iron Ore Co. of Canada in Labrador and Quebec expects to reach an initial production of 5-million tons in 1955 and 10-million tons in 1956. Tonnage of high-grade ore proved to date exceeds 41.8-million. Investment: $200-million.

U. S. Steel's Orinoco Mining Co. in Venezuela is developing hugh Cerro Bolivar deposits of high-grade iron ore. Tonnage exceeds half a billion.

Bethlehem Steel Co.'s El Pao mine in Venezuela is boosting its output of high-grade ore. It expects to schedule 3 million tons per year when in full swing and possibly 5-million later.

Marcona Mining Co., in Peru, owned jointly by Cyprus Mines Corp. and Utah Construction Co., will soon be producing 200,000 tons monthly of high-grade iron ore. Initial investment is about $10-million.

COPPER

United States

	INVESTMENT
Anaconda Copper Mining Co., Butte, Mont.	$27,000,000
Anaconda Copper Mining Co., Yerington, Nev.	38,000,000
Anaconda Copper Mining Co., Refinery expansion	5,500,000
Anaconda Copper Mining Co., Brass mills & misc.	40,500,000
Phelps Dodge Corp., Bisbee, Ariz.	25,000,000
Miami Copper Co., Copper Cities, Ariz.	$15,000,000
Miami Copper Co., Globe-Miami Project	3,000,000
Copper Range Co., White Pine, Mich.	57,000,000
American Smelting & Refining Co., Silver Bell, Ariz.	17,000,000
Kennecott Copper Corp., Deep Ruth Project, Nev.	14,000,000
San Manuel Copper Co., Oracle, Ariz.	111,000,000
Calumet & Hecla Cons. Copper Co., Osceola Mine, Mich.	6,000,000
Total Investment	$359,000,000

Foreign

In Chile, the $111-million sulphide ore project at Chuquicamata has entered production.

In Peru, A.S.&R. is doing engineering studies on the Toquepala property, a potential major producer. Cerro de Pasco is exploring a possible copper property.

In Rhodesia, major mining and refining expansion programs have been announced. The Belgian Congo will expand production facilities.

In Canada, Noranda, Falconbridge, International Nickel, Sherritt-Gordon, and many others have announced expansion programs at new or existing properties.

LEAD AND ZINC

United States

American Smelting & Refining Co.
- Corpus Christi, Tex.
- Selby, Calif.
- Van Stone Mine, Wash.
- Amarillo, Tex.
- Newark, N. J.

St. Joseph Lead Co.
- Balmat, N. Y.
- Indian Creek, Mo.
- Herculaneum, Mo.
- Haydon Creek, Mo.

New Jersey Zinc Co.
- Austinville, Va.
- Friedensville, Pa.
- Palmerton, Pa.
- Ogdensburg, N. J.

Blackwell Zinc Co., Blackwell, Okla.

Universal Exploration Co., Jefferson City, Tenn.

Bunker Hill & Sullivan M. & C. Co., Kellogg, Idaho

American Zinc Co. of Tenn., North Friends Sta., Tenn.

Eagle Picher Co., Galena, Kans.

Anaconda Copper Mining Co., Butte, Mont.

Total Approximate Investment: $79,000,000

Foreign

In Peru, Cerro de Pasco is shifting emphasis to lead and zinc production in a major expansion and modernization program.

In North Africa, the Zellidja, and nearby properties, have outlined a new major producing area.

In Canada, Consolidated M. & S. Co. is completing an expansion of production facilities; Barvue is opening up a 4,000-ton lead-zinc mine; British Columbia is bursting with new lead-zinc production; a new find of lead-zinc-silver ore has been made in New Brunswick.

ALUMINUM

United States

PROJECT	CAPACITY (In tons per year)
Aluminum Co. of America, Point Comfort, Texas	85,000
Aluminum Co. of America, Wenatchee, Wash.	85,000
Aluminum Co. of America, Rockdale, Texas	85,000
Kaiser Aluminum Co., Chalmette, La.	100,000
Kaiser Aluminum Co., Mead, Wash.	177,000
Reynolds Metals Co., Corpus Christi, Texas	75,000
Reynolds Metals Co., Longview, Wash.	50,000
Reynolds Metals Co., Little Rock, Ark.	55,000
Anaconda Copper Mining Co., Kalispell, Mont.	50,000
Olin Industries, Inc., Alton, Ill.	110,000
Harvey Machine Co.	54,000
The Wheland Co., Chattanooga, Tenn.	50,000
Total new capacity, tons aluminum per year	976,000
Total approximate new investment required	$846,000,000

OTHER METALS

United States

NEW PROJECTS (PARTIAL LIST)	INVESTMENT
Manganese	
New mines or plants opening in Tenn., Ark., Nev., Minn., Ohio	$15,000,000
Cobalt	
National Lead Co., Fredericktown, Md.	5,000,000
Howe Sound Co., Cobalt, Idaho	8,500,000
Molydbenum	
Climax Molydbenum Co., Climax, Colo.	10,000,000
Titanium	
National Lead Co., Las Vegas, Nev.	14,000,000
E. I. Du Pont de Nemours & Co., Wilmington, Del.	15,000,000
Uranium	14,000,000
Nickel	
International Nickel Co., Ely, Minn.	
M. A. Hanna Co., Riddle, Ore.	29,000,000
Total Investment	$110,500,000

NON-METALLICS

New processes and new uses for non-metallic minerals put this industry on the threshold of a tremendous growth in demand.

NEW PROJECTS (PARTIAL LIST)	INVESTMENT
Asbestos	$40,000,000
Sulphur	25,000,000
Potash	28,000,000
Phosphate	25,000,000
Fluorspar	5,000,000
Total Investment	$123,000,000

EXTRA COPIES AVAILABLE

Many mining companies have indicated that they will want extra copies of this issue. If you want extra copies of E&MJ's July issue, "Mining's Greatest Era," write to the E&MJ editor now and reserve your copies. Price per copy is $1.00, U.S., U.S. Possessions, and Canada; other countries, $1.50.

Coeur d'Alene silver belt at a depth about 300 ft. below sea level. Initial work will be an easterly drift nearly 2 mi. long from the 3,000-ft. level of the Polaris Silver Summit shaft to explore a mineralized shear zone.

★Installation of a 22-hp. pump with capacity of 2,000 gpm. has solved the problem presented to **Triumph Mining Co.** (Lewis Robinson, general manager) when water flowed in on the 1,000 level of its mine near Hailey in Blaine County's Warm Springs district. Production from upper levels was maintained while unwatering was in progress.

★Unwatering of old upper workings of **Nabob Silver-Lead Corp.'s** (C. C. Dunkle, of Pinehurst, vice president and general manager) Denver vein in the Pine Creek area of the Coeur d'Alene district revealed 350 to 400 ft. of virgin stoping ground at the 750 and 900 levels of the shaft—considerably more than had been anticipated.

★**Snoose Mining Co.** has begun shipment of ore from a development winze now being sunk from the 200 level of its mine in Blaine County's Minerals Hills district.

★A new vein of silver-lead ore has been discovered on the 2,000 level in the western part of **Lucky Friday Silver-Lead Mines'** workings in the Coeur d'Alene district east of Mullan. Lucky Friday's preparing now to sink to the 2,200 level.

★**Golconda Lead Mines** is committed under a $90,000 DMEA contract to explore downward extension of orebodies from the 1,800 level along the east drift to the boundary of its property east of Wallace, probing with crosscuts and diamond drilling from the drift. A larger hoist and skip has been installed in the shaft.

★**Day Mines, Inc.,** has been deepening the main shaft of its Hercules mine northeast of Wallace from the 1,200 to the 1,600-ft. level.

★Robert J. Fanning, of Wallace, is listed as an incorporator of each of two new mining concerns in the Coeur d'Alene district, associated with H. J. Rossi, of Boise, and R. G. Binyon, Wallace, in formation of **Osburn Silver-Lead Mining Co.** with authorized capital amounting to $300,000; and in association with R. C. McDonel, of Wallace, and A. E. Lunden, Coeur d'Alene, in formation of **Blue Sky Mines, Inc.,** with $200,000 capitalization. The former company will develop an 80-acre homestead tract near Osburn in the Silver Belt. Blue Sky will develop a four-claim group in the Dobson Pass area north of Wallace.

★**Eureka Silver King Mines Corp.** has scheduled 1,000 ft. of underground exploration work in its prospect in Valley County's Warm Lake area in the current year, John E. Dolan, of Boise, president and manager, announced. He said work to date had exposed silver-lead ore with gold, copper, and zinc values on four levels.

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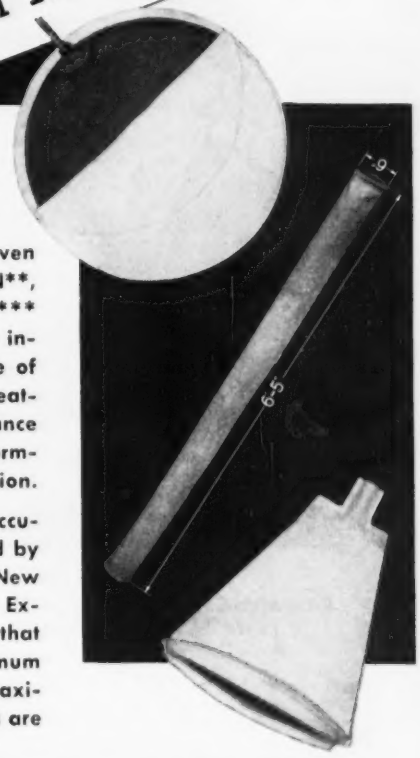

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MICHIGAN

★The **$70-million White Pine project** of Copper Range in Ontonagon County is now 21% complete. Over $10-million has been spent, and another $14-million has been committed. Completion will be in late 1954. At present workers are but 40 ft. away from the orebody. Preliminary blasting will start shortly. About a million tons of ore are expected to be stockpiled before the mill and smelter are ready. At full production the mine will yield about 13,000 tons of ore daily.

★A reduction of **$303,000 in the assessed valuation** of mining properties (including refined copper) in Houghton and Keweenaw Counties has been recommended to the Michigan State Tax Commission by Harry J. Hardenberg, deputy state geologist and appraiser of mines. The recommendations are usually reviewed by the State Tax Commission at a public hearing before they become effective.

MONTANA

★Geologists and other interested persons have been invited to attend the **6th annual meeting of the Rocky Mountain section, Geological Society of America,** May 7, 8, and 9 in Butte, it was announced by Charles E. Erdmann, section secretary and USGS staff member. Headquarters will be in the Finlen Hotel. Three field trips are scheduled Saturday (May 7): an all-day tour illustrating stratigraphy and structure in the classical Three Forks area, a morning trip underground in Anaconda Copper Mining Co.'s Butte mines, and an inspection in the afternoon of an interesting contact facies of the Boulder batholith near Divide. If interest warrants, two all-day trips will be scheduled the following day, one to inspect petrology and structure in the northern part of the Boulder batholith near Helena, the other to comprise a study of stratigraphy and structure in the Philipsburg-Drummond area.

NEVADA

★The U. S. Atomic Energy Commission is investigating a **new uranium find** 40 mi. from Fallon and adjacent to the Rawhide mining district. The find was made by George C. Coverston, A. L. Robinson, and O. C. Engebretson, all of Fallon. Samples assayed in Salt Lake City showed two types of uranium ore running .368 and .445% U_3O_8. Floyd J. Conklin and H. Clyde Davis, engineers sent out by the commission, declared the ore to be commercial grade uranium.

★**Daily output of titanium** has reached 10 tons at the Titanium Metals Corp. of America plant at Henderson, and available facilities may soon be expanded to produce up to 40 tons daily,

according to company officials. Three sections of the Basic Magnesium plant are being used by the Metals Corp. in its operations.

★**Sierra Pacific Power Co.** has just completed installation of a new power line to serve Anaconda Copper Mining Co.'s workings near Yerington.

★**Fire at the Imperial lead mine** south of Reno on Feb. 26 did damage in excess of $50,000 and nearly trapped four men at the 1,400-ft. level. A dynamite blast set off inside the mine coincided with an explosion of a diesel motor on the ground level. Fire spread rapidly and destroyed the engine house, a workshop, two diesel engines, a compressor, several electric motors, and a quantity of tools. The main entrance to the mine was blocked when timbers caught fire, but the men escaped through the old tunnel which had only recently been opened. The new $100,000 mill was undamaged.

★**Eureka Corp.** has launched a $3-million program at its Richmond-Eureka mine 2 mi. from Eureka. Aided by a $750,000 government loan, the corporation is repairing the 2,350-ft. four-compartment Fad shaft to the water level, and core drilling has been carried out to locate ore deposits on or above the 1700-ft. level. Pumps are ejecting 3,600 gal. of water per minute from the Fad shaft, and this may be stepped up to 6,000 gal. The company employs 75 men and hopes to have the mine on a production basis as soon as the lower levels are freed of water.

★**Parker Bros.**, who have been shipping 30 cars of iron ore per week from their property south of Lovelock, are building a loading ramp at Colado on the Southern Pacific tracks. Ore is now being trucked to Oreana, and the new loading ramp will greatly shorten the distance from the mine to the tracks. Shipments are being made to Youngstown Sheet & Tube Co. in Chicago.

★**Central Eureka Corp.**, San Jose, Calif., plans to acquire a large scale sulphur production enterprise at Sulphur, Nev., which has been financed and developed by Edward H. Heller, a principal stockholder of the corporation.

NEW MEXICO

★**Zinc-lead mining is nearing a standstill** in New Mexico. The fourth major shutdown of the Ground Hog mine in the central district, Grant County, was announced by the American Smelting and Refining Co. Feb. 25. A total of 700 miners have been let out of work. The only major operator in the district now going ahead is the U. S. Smelting, Mining & Refining Co., at Bayard. Kennecott Copper is using 40 men at its Oswaldo No. 2 for development work, and Empire Zinc has about the same number of men on development at its property.

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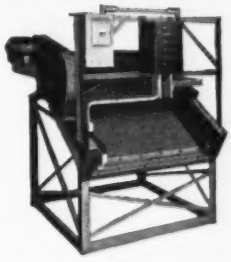

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OREGON

★According to the Oregon Department of Geology and Mineral Industries, the current unseasonal increase in the **number of chrome ore samples** shipped to the department indicates that work on claim locations in southwestern Oregon will be stepped up. R. S. Mason, state mining engineer, explains that in the past, shipments of samples for assay have been a fairly accurate barometer of forthcoming summer activity.

The U. S. Government maintains a receiving depot at Grants Pass to encourage chrome production coming principally from the coastal mountains lying astride the Oregon-California border.

Mason reports that samples running about 1,000 a year, drop off during the winter months through April. This year the sampling and location data have increased substantially since the first of the year.

OHIO

★Rumor's rife that prospecting and speculation in the **search for germanium and uranium hereabouts** are rapidly accelerating, but the official reply to the hubbub is announcement that the search is going on—has been for years—and hasn't turned up anything to start a general migration to Ohio.

Dr. James M. Schopf, supervising geologist in the Columbus office of the USGS' coal laboratory, said analyses to date have failed to reveal any high-grade uranium ore. He disclosed that USGS has been sampling black shale outcrops along the Olentangy River north of Worthington since 1945 but said, "so far nothing has been found to become excited over."

The Columbus *Dispatch* quoted sources in Ironton (O.) saying 17 government men were surveying Lawrence County under a heavy veil of secrecy, apparently hunting germanium, and that a landholder there had been offered "big money" for an 1800-acre tract that, it's said, he leased to the government through the offices of an Ashland, Ky., attorney.

NORTH CAROLINA

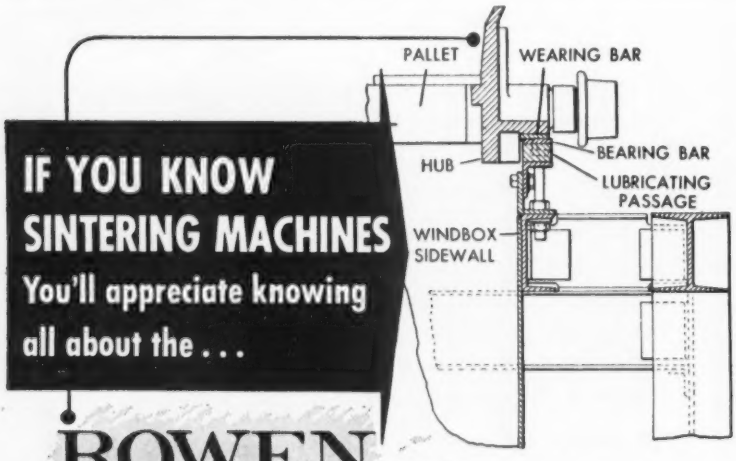
★Mining interests in western North Carolina say that an early decision of the Munitions Board to buy certain grades of **non-ruby sheet mica** for government stockpiling could stimulate deliveries of non-ruby mica to a volume valued at $3-million to $5-million yearly by the end of 1953. Since the government began buying ruby sheet mica for stockpiling last July, the depot at Spruce Pine has purchased about $800,000 in grades of mica acceptable under the program.

Western North Carolina mining men have contended that green mica meeting the same specifications as ruby is just as good for highly important uses in electronic devices. S. T. Henry, publisher of the Tri-County News, says that despite the efforts of certain mica interests to discredit the value of non-ruby mica, he had been informed by Rep. Charles R. Jones of North Carolina that "in response to discussions with the Munitions Board, new specifications will soon be issued calling for stockpiling of certain grades of non-ruby mica."

TEXAS

★**The Texas Mining & Smelting Division** of National Lead Co. will be operated as a part of the company's metal department. This division, with headquarters in Laredo, Texas, has antimony mines in Mexico, the ore from which is processed at Laredo into antimony metal, vital as an alloying agent in metal products, and antimony oxides. Mine and plant operations of the Texas Mining & Smelting Division will be directed by Gloyd M. Wiles, manager of National Lead's mining department.

★**The Terlingua quicksilver** district of Texas, in the Big Bend area south of Alpine shows signs of renewed ac-



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tivity with the reopening of the Fresno mine in January. The Fresno mine was an important producer during World War II. Ameritex Mining Co., headed by R. N. Pulliam, is operating the property with an initial crew of 27 men. Results of work so far indicate that furnacing can be started in the near future at a rate of 30 to 50 tons of ore per day. R. N. Pulliam was the last of the operators in this district to shut down in November, 1947, and the first to resume operations with more favorable mercury prices.

UTAH

★Directors of two major mining firms in the Park City district have signed an agreement to consolidate their companies into a new firm to be known as **United Park City Mines Co.** The action was taken on March 3 by representatives of the Silver King Coalition Mines Co. and Park Utah Consolidated Mines Co. John M. Wallace, president of the Walker Bank & Trust Co., will head the consolidated firm. Stockholders of Silver King Coalition are scheduled to meet April 27 to vote on the consolidation, and Park Utah stockholders will meet on May 5 to consider the agreement of the directors.

★**Howe Sound Co.** officials reported in Salt Lake City March 4 that cobalt production at their new Garfield refinery is now mounting satisfactorily, with output reaching 5,000 lb. per day "on occasion." Plant officials are hopeful of reaching a 10,000-lb. per day goal shortly.

★**Minerals Engineering Co.** of Grand Junction, Colo. has announced plans for a tungsten refinery at Salt Lake City to be built at a cost of some $700,000. The new refinery would handle ores from Montana and Nevada, and serve as a Utah stockpile.

Linked to the plan is the Eimco Corp. of Salt Lake City, mining machinery manufacturers, which has sold a 12-acre tract on the Jordan River to Minerals Engineering Co. for the plant.

Eimco plans to reduce some 30,000 tons of tungsten concentrates already on hand, which were acquired after World War II.

The firm also plans erection of a $225,000 tungsten ore concentrator at Glen, Mont., in connection with its related metals project.

WASHINGTON

★**A second diesel-powered "Gismo"** was installed at the Grandview mine at Metaline Falls this spring, raising mechanization to 100% and permitting operations at a profit despite current low lead and zinc prices. The "Gismo," a combination mucking machine, shuttle car and drill jumbo, enabled six men working 24 hours in January to produce 14,852 tons of ore, or more than 103 tons per man-shift, according to Dale I. Hayes, inventor of the unit and western manager for American Zinc Lead and Smelting Co. Before the "Gismo" was put into use, production was 14 tons per man-shift.

★**Kaiser Aluminum & Chemical Corp.'s** Trentwood plant is to have a $300,000 pipe mill for production of aluminum tubing. The almost fully-automatic pipe mill will occupy 10,000 sq. ft. An automatic induction welding device will seal seams without overlap.

★**Pioneer Mining Co.** shipped its first car of zinc concentrate from its Longshot mine to the Sullivan electrolytic zinc plant at Kellogg, Idaho, early in March. A carload of lead concentrate was scheduled to go to the Bunker Hill smelter shortly after, according to D. A. Newland, president and general manager. During the testing period about 30 tons of ore were handled daily. The company operates a 50-ton lead-zinc flotation plant.

★**Grandview Mine, Inc.,** increased its search for new orebodies during 1952, doing 4,800 ft. of diamond drilling and 1,275 hours of bulldozer stripping and blasting of prospect holes at five prospects in Stevens and Pend Oreille Counties. High-grade lead-zinc ore has

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Washington *(Continued)*

been found in some places, but more work is to be done to determine the value of the deposits. One showing included a narrow vein of 4% nickel at the A. Anderson prospect. At the Dosser prospect, the company uncovered a large iron capping assaying 3½% lead across 40 ft. A 4½-ft. rib of high-grade zinc ore was uncovered for 500 ft. in the Jim Creek district. This is in limestone 100 ft. below surface.

★**Harvey Machine Co.** will start construction of its $65-million aluminum plant near The Dalles by June 30, according to an announcement by Harold J. Sullivan, public relations director. About 1,000 persons will be hired for construction work and about 500 will be employed in the production of aluminum. The site has not been decided but the company has options on property on both sides of the Columbia River near The Dalles. The plant is expected to produce 54,000 short tons of aluminum annually.

WISCONSIN

★**Piquette Mining & Milling Co.** has started development of an orebody at Tennyson, Grant County. Francis Piquette, Platteville, is company partner and general manager. An old shaft has been cleaned out, and a 1,200-gpm pump installed to dewater while sinking an inclined adit. The 12x16-ft. adit will be driven at about a 10% grade. When completed the incline length will be 1,100 ft. The first 200 ft. will be by open cut.

Mining will be by casual room and pillar, and the ore will be hauled to the surface in diesel trucks for crushing at the mill. Land for the millsite has been purchased. Mill plans include gravity separation by jigs, and a flotation unit designed to allow for a ready increase in capacity from the initial 200 tons per day of float feed.

IN CANADA

BRITISH COLUMBIA

★**Frobisher Ltd.**, one of Canada's largest exploration, development and holding companies, will survey water resources of the British Columbia-Yukon border area in a search for cheap hydro power in what is reported as a possible plan to establish a metals plant in northern Britsh Columbia. At the same time, Frobisher is reported to be holding a major interest in the staking of a rich, new copper deposit 25 mi. northwest of Premier, B. C. on 7,00-ft. Leduc Glacier.

Approval for the Frobisher waterpower survey in B. C. recently was granted by the provincial government. Permit for the Yukon portion of the

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Canada *(Continued)*

survey previously was granted by the federal government at Ottawa. Frobisher is seeking hydro power to utilize new metallurgical processes developed by its subsidiary, **Quebec Metallurgical Industries.** Experts hope Q-M's new smelting process, tested in an Ontario pilot plant, will cut to a fraction of present figures the cost of aluminum, magnesium and other metals.

Key to the deal is that any plant planned by Frobisher must be established in Canada, and reports indicate such a project would preclude any possibility that Aluminum Company of America would get Canadian waterpower for an Alaska refinery. Frobisher's survey area is the same as that sought by Alcoa for power. Frobisher plans are based on a 500,000-hp. development costing more than $1-billion. This compared with Aluminum Co. of Canada's Kitimat-Kemano development of 1,600,000 hp. at a total cost of some $600-million. Source of Frobisher's waterpower would be the 17,000-sq.-mi. Atlin Lake, Taku Lake, and Lake Larberge basin which drains into the Yukon River. Project would involve dams on Lake Larberge and a tunnel between the Yukon River drainage system and the Alsek River where a power plant could be located. Possible plant sites are Dry Bay and Glacier Bay, both just inside the British Columbia boundary and across from the Alaskan panhandle. Frobisher has given no details as yet of the size or scope of any metals plant it might build. Surveys on waterpower are to start this spring, with some further details due to be released in the fall.

★Three mining men, returning from a helicopter prospecting expedition, report they have staked 72 claims on Leduc Glacier for Frobisher Ltd. and "an amalgamation of other large eastern mining interests." The men, Bill Richardson, Wendel Dawson and Howard Fowler, former Alaska Government mining engineer, said they staked three-quarters of the peak in a claims-staking race with Granby Consolidated Mining, Smelting & Power Co. Ltd. representatives who staked the remaining quarter of the deposit. Richardson said the deposit was a zone 4,000 ft. long and 100 ft. wide running through the hill at an unknown depth, with assays showing 2 to 5% copper, with some gold and lead also present.

★**A new 10% resources levy** on primary mining operations in British Columbia, aimed at "catching the big fellow," has been announced by the province's new Social Credit Government in its first budget. The new 10% levy, with an exemption of $25,000 on net profit, replaces the old 4% levy which carried a $5,000 exemption on gross income. It applies on primary operations, not on processing of mining products.

★Fifteen mining operations in B. C. closed down since last July 31, Mines Minister Robert Sommers told the legislature in early February. Shutdowns were due, he said, to high cost of production, lower prices for lead and zinc, power shortages, bad weather or exhausted resources. Within a week after the mines minister's disclosure, two more mines announced closures.

Sheep Creek Gold Mines Ltd. shut down its Paradise mine at Inverness because of a further drop in base metal prices. Meanwhile, Sheep Creek's new base metal mine, the Mineral King, in the same area, is continuing with plans for a mill to handle 300 to 400 tons daily.

Another British Columbia mine to close is the **Silbak Premier Mines Ltd.**, which has closed down mining operations at Premier, because of the low price of lead and zinc. Milling of broken ore will continue for about two months when all operations at Premier will end.

★**A new asbestos find** is reported near Lillooet, where claims have been staked by Harry Reynolds, prospector in the Bridge River area for many years. He reports a mineralized zone of 60 ft. wide and 100 ft. long, with samples of surface outcrop said to be high-grade with fiber soft and silky.

Canadian MINING ON THE MARCH

Roof support for protection of men working underground is of vital importance in Canadian mines. Early miners sometimes depended on rock formation to support the "back," also used primitive timbering and posts.

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★A bill is to be introduced into the British Columbia legislature at the present session incorporating Kitimat, center of **Aluminium Co. of Canada's** new smelter, as a public municipality, carrying out Alcan's plan to avoid a company town.

Work is going ahead on water mains, sewers and other services and 80 houses will be built this summer and sold to private owners. A $7-million ocean wharf is expected to be completed by this autumn, and a $1-million steel bridge is being built over the Kitimat River to connect the smelter area with the townsite, which will be 6 mi. from the dock and 3 to 4 mi. from the industrial area.

These plans were disclosed by McNeeley Dubose, Alcan vice president, on a visit to Vancouver. He said that when production on two potlines begins on April 1, 1954, the plant will employ 1,100, which with auxiliary services will be around 1,550 families or a population of 6,000 to 7,000 persons, requiring 1,500 housing units.

Meanwhile, at the plant site, despite sub-zero weather in February, half the footings for the potlines, which will produce 78,000 tons aluminum ingots yearly, are in place. Precasting of steel-reinforced concrete slab walls for the potline buildings is in progress under movable sheds. Pouring of foundation floors is planned for spring. Dredging of the dock area to permit maneuvering of 10,000 ton ships with bauxite from Jamaica has been completed. Material dredged from the ship channel forms the fill for the 15-acre dock area. Three concrete caissons, which will form the seaward faces of the dock, are under construction in a drydock at the site. Caissons are 250 ft. long, 48 ft. and 60 ft. wide. On completion, seawater will be admitted to the drydock, the caissons floated into position and sunk.

MANITOBA

★**San Antonio Gold Mines Ltd.** has completed 20 years of continuous production, with development work on deeper horizons indicating that the grade of ore can be maintained. Development of the company's subsidiary, Forty-four Mines, shows possibilities of production by next year. The company is continuing outside exploration, and will participate in the drilling of two showings on its new property at High Lake, near the Ontario-Manitoba boundary.

★**God's Lake Gold Mines** has let a contract for an electro-magnetic survey of its 147 claim property located east of Lynn Lake. At a special general meeting in Winnipeg, approval was given to a capital increase in the company from 3,500,000 shares to 5 million shares.

★**Cypress Exploration** reports that drilling of its uranium showings at Dion Lake in northern Manitoba has been disappointing. Further work will be carried out on the 300 claim property this spring, as several surface showings remain to be investigated.

NEW BRUNSWICK

★This will be the busiest mining exploration year in the province's history, and by a wide margin. Following disclosure of the big lead-zinc-pyrite deposit discovered by **Brunswick Mining and Smelting Corp.** near Bathurst, the area has been invaded by prospectors and mining interests from every part of Canada. It is estimated that a section of 200 sq. mi. has been staked practically solid, and the coming of spring will see an army of prospectors, surveyors, and drillers at work. An indication of the excitement created can be had from the market action of shares in New Larder "U" Lake Mines, which rocketed in eight weeks from 8¢ to $2.75 per share as the company started diamond drilling on a big anomaly.

Main actor in the scene is still Brunswick Mining, which kept well in the spotlight with fine results from deep drilling which has extended the known depth of its big orebody (with volume close to 30,000 tons per vertical ft.) to the 800-ft. horizon. It is

Picture shows a 400-ft. span Sauerman Drag Scraper machine, powered by a 150 h.p. motor, backfilling an empty stope at a large nickel mine in Canada. Scraper cuts into side of hill and moves earth down to a raise at rate of 2,000 cu. yd. a day.

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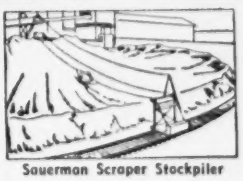
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Canada *(Continued)*

expected that milling plans for Brunswick, probably to be initiated at 3,000 tons daily from open-pit mining, will be well formulated by the start of summer.

★**Estella Mines Ltd.**, with executive offices at 736 Granville, Vancouver, B. C. (E. J. Chapman, pres.) has staked 25 claims through Vancouver mining engineer north of the Brunswick Mining & Smelting Co. property. The Estella claims are reported to be on the strike of the main Brunswick vein. A field crew has been engaged to stake further properties in this and other New Brunswick areas. A diamond drill crew will be sent to the group now staked.

NEWFOUNDLAND

★**A big exploration program** is being lined up for the coming season in areas controlled by Newfoundland and Labrador Corp. A total of $500,000 has been budgeted: part by the company itself, which will have 14 geological parties in the field at an estimated cost of $375,000; the remainder by Newmont Mining Corp. and American Zinc, Lead and Smelting Co., each of which has been given rights in certain areas. Newfoundland and Labrador Corp. holds concession rights on 12,900 sq. mi. in Labrador and 9,000 sq. mi. on Newfoundland Island.

ONTARIO

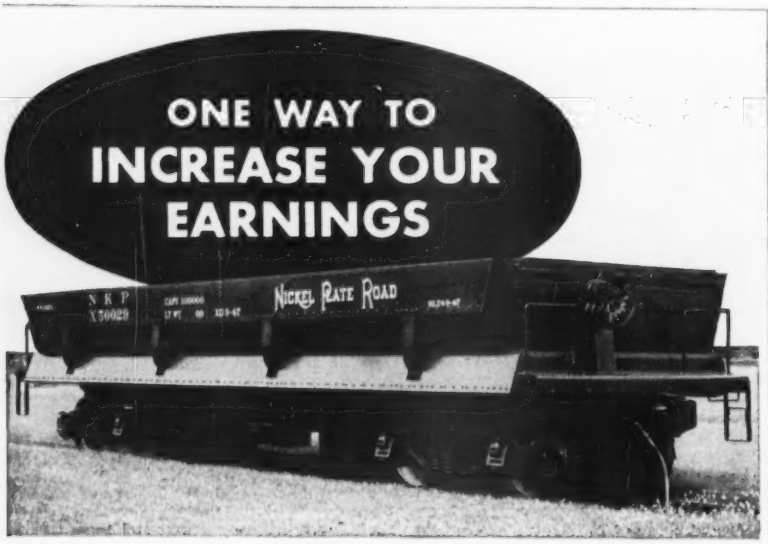
★**Kerr-Addison**, Canada's largest gold producer, raised output value to $12.5-million in 1952, a new record. The good showing was due to higher tonnage and slightly better grade. The mill is now averaging 4,500 tons daily.

★**Profit paring was the order** of the year for most gold mines. Two Kirkland Lake veterans, **Lake Shore and Kirkland Lake Gold** reflect this in their annual reports. Lake Shore showed a net loss for the first time in its 34-year history. The usual gold mining problems were aggravated in the Lake Shore case by rock bursts. Kirkland Lake made a profit 2.0¢ for 1952 as compared with 2.9¢ for 1951, but showed a slight reduction in ore reserves and working capital.

★**Algoma Ore Properties**, iron producing subsidiary of Algoma Steel Corp. in the Michipicoten area, is scheduled to become one of Canada's largest single underground mining operations. Plans now being completed call for the hoisting of close to 8,000 tons of ore daily. All production now comes from the Helen mine, where 20 years' millfeed can be seen without difficulty, while two good adjoining mines, the Alexander and the Victoria, are being groomed for production. When all three are operating, the company will be mining ore along a strike length of more than a mile.

★A five-year option has been taken by **Falconbridge Nickel Mines** on the 12-claim property of Junior Frood Mines in McKim Twp., Sudbury area. Located on the norite contact alongside Falconbridge's McKim mine, the Junior Frood ground has been recognized for many years as one of the most inviting prospecting sites of the Sudbury Basin, but has been idle since the late 1920's. The company receives 5,000 Falconbridge shares in return for the option, and Falconbridge agrees to spend at least $500,000 on the property during the five years. Total purchase price of the ground is escalated from 200,000 shares if bought during the first year of the option, to 320,000 shares if taken over in the final year.

★Diamond drilling is being started by Ventures Ltd. on the nickel-copper property of **Kelore Mines** near Hawk Junction, Michipicoten district, under an agreement whereby Ventures is to spend $100,000 on the project before the end of September, and receives an option on control of Kelore, which has revamped its capital structure on a one-for-five basis to make that possible. The property is the former Lakemount ground on which a large though low-grade nickel-copper tonnage was indicated in former drilling.



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★**Cheskirk Mines** has taken a working option on 14 claims in the Temagami area where surface prospecting revealed a number of outcrops carrying values in copper, nickel, gold, silver, and platinum. First work to be done under the option will be diamond drilling, recommended by the company's consulting engineer following completion of magnetometer and resistivity surveys.

★**Ornum Copper Mines** has been formed to explore a group of 19 claims in Beatty Twp., about 7-mi. northeast of Matheson. The ground is a copper prospect, the original discovery having been made in surface prospecting which disclosed a vein 15 ft. wide carrying mineralization of that metal in sulphides. Subsequent geophysical surveying revealed a number of anomalies considered strong enough to warrant drilling.

★**Coldstream Copper Mines** has been financed for further development of its property in Ames and Moss Twps., Thunder Bay district, where work was stopped last year before the first level had been fully developed. A start is now being made at unwatering the workings and it is expected that development will have been resumed in full stride by the end of April.

★Grade of ore at **Milnet Mines** on the northeastern side of the Sudbury Basin is standing up well to expectations. The first 4,500 tons shipped to the Falconbridge concentrator averaged 2.11% nickel and 1.75% copper, although all of it came from development work. Current shipment rate is approaching the objective of 300 tons daily, stope preparations having been just about completed. The mine is owned jointly by Moneta Porcupine Mines, Berens River Mines (Newmont subsidiary) and Jonsmith Mines.

★Inspiration Mining and Development Co. has issued the following report on drilling results at the company's property at Lake Nipissing: "In the drilling to date amounting to 14 holes, there is indicated a strike length of 750 ft. with radioactivity of appreciable amounts over widths of at least 100 ft. From three different assay sources, 17 columbium-tantalum assays have been secured to date. Fourteen of these samples are over 0.5% columbium and tantalum oxides, and have ranged up to 2.19%." In addition it was reported that assays from holes No. 5 and 6 yielded uranium assays ranging from 0.057 to 1.0% U_3O_8.

QUEBEC

★A new deep underground drilling program is being started by **Lake Dufault Mines** on its property in the north Noranda district, the work being designed to probe down to the main rhyolite contact at the 2,000-ft. horizon. It is being done from an extension of Waite Amulet's 1,650-ft. level driven into Lake Dufault ground for that purpose.

★Adverse effect of lower zinc prices and the lower world price for gold is seen in the earnings statement of Quemont Mining Corp. for 1952. Tonnage milled during the year was raised to 775,218 tons (759,663 tons in 1951) but net profits declined to $4.2- from $5.2-million.

★**Normetal Mining Corp.** which, like Quemont, is controlled by Mining Corporation of Canada, also reports lower profits. Net for 1952 was 55.2¢ per share versus the 74.5¢ chalked up the previous year, with lower zinc prices chiefly responsible. Tonnage milled during the year showed little change from that which was treated in 1951.

★The shaft being sunk at the Chibougamau district property of **Chibougamou Explorers Ltd.** is close to its depth objective of 800 ft., and it is expected that lateral work will start on all five planned levels before summer. Mine manager W. Griffin estimates ore indicated in the main shoot at 515,677 tons averaging 0.304 oz. gold per ton along with 0.76% copper.

★An all-time high was recorded in 1952 by **Asbestos Corp.** for net profits, which worked out to $2.36 per share compared with $2.17 in 1951. Working capital at the end of the year stood at

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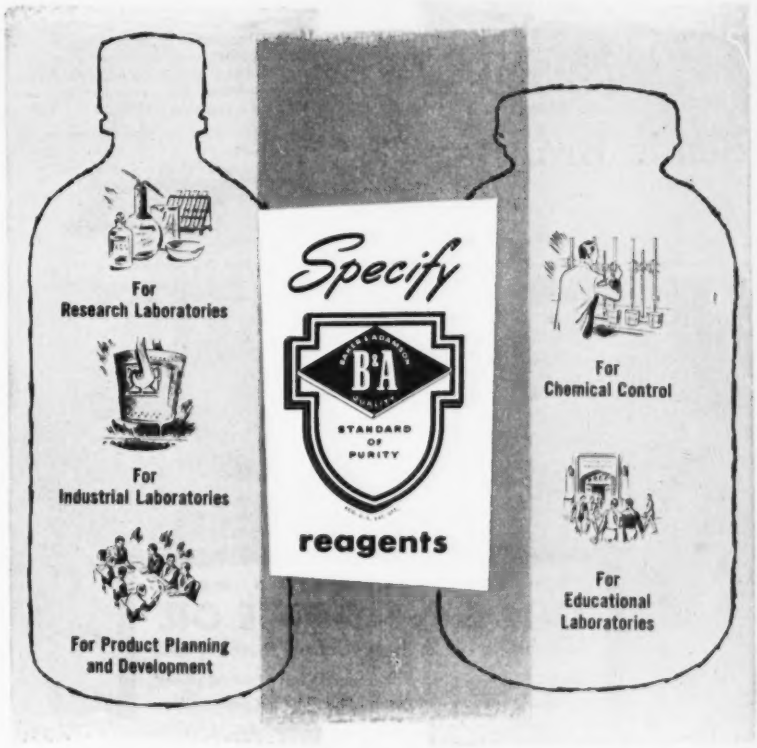

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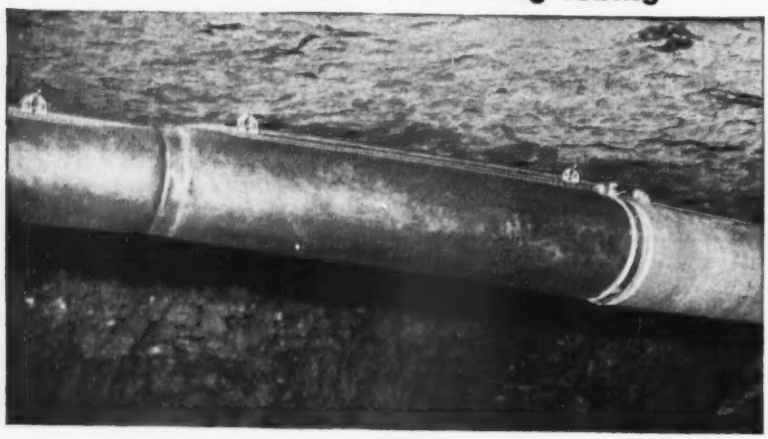

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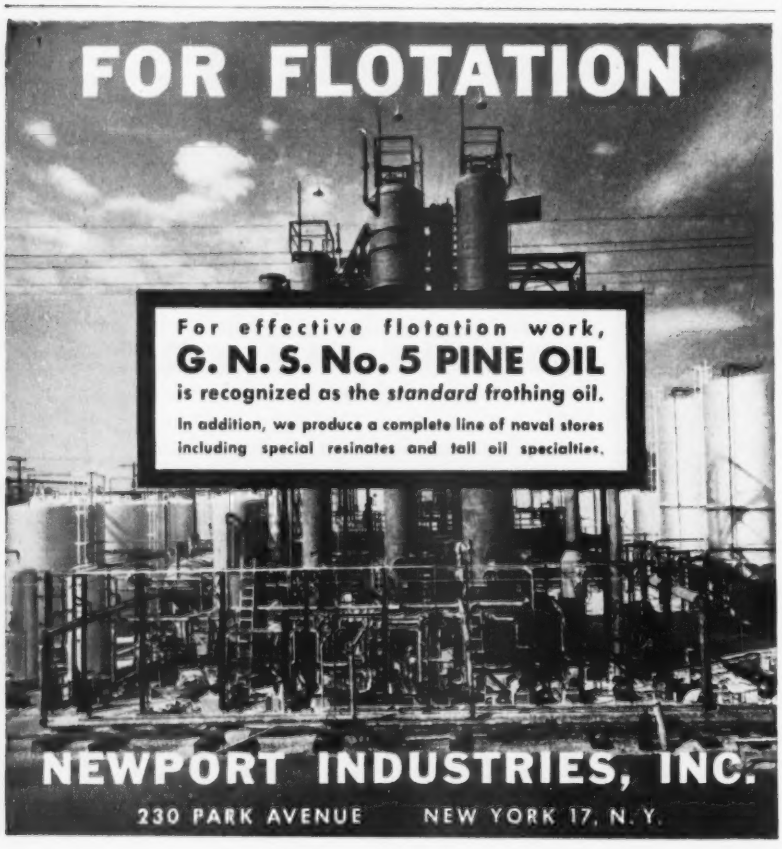
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Canada *(Continued)*

$4.9-million. The company's four producing mines in the Thetford area operated close to capacity all year, and output showed an increase of 16% in value. Work proceeded on schedule on the establishment of the fifth mine, the Normandy, where a 2,000-ton mill is under construction.

★**Noranda Mines** is going ahead with plans to bring the western portion of Macdonald Mines' property into production, with plans made for milling on a basis of 1,500 tons per day. The mine is in Dufresnoy Twp., Noranda area, and is to be operated on a profit-sharing basis, a large tonnage of pyrite-zinc ore having been developed by Macdonald in its original work some years ago. On the eastern part of the property, retained by Macdonald, a large scale surface drilling program is planned for the coming season.

★Start of production is scheduled for mid-April by **Dominion Asbestos Mines,** developing the former International Asbestos property in Ham Twp., Wolfe County, near Fabian. The milling plant, being completed, has a rated capacity of 2,200 tons daily, and available ore reserves are estimated at 23-million tons averaging 7% asbestos; average value $7.35 per ton. Mining will be done by open-pit methods.

SASKATCHEWAN

★**Graham Bousquet Gold Mines Ltd.,** with a base metals property in Lynn Valley, near Vancouver, B. C., has acquired controlling interest in another property in the Beaverlodge uranium camp, the 17-claim McLeod group north and east of Nesbitt-Labine's holdings in the area. Graham-Bousquet previously acquired claims adjoining Gunnar Gold and Chimo's St. Mary's Channel groups.

★**Beaverlodge Uranium Mines Ltd.,** Vancouver, B. C.-controlled company is engaged in a depth-drilling program to investigate the persistence of three claims of its Beaverlodge Lake district property. Earlier work has revealed good surface showings and encouraging values in the underground drive at depth of 83 ft. The company's claims are 2 mi. north of the Ace shaft of Eldorado.

★**Uranium claims of Salmo Prince Mines Ltd.** in the Lake Athabaska area near Bushell will be examined by Seattle engineer Frank Price for United States interests. Salmo Prince plans an exploration program in the spring, to be carried out by Westcan Corp. Ltd. of Calgary. The claims are in the general area being developed by the government-owned Eldorado Mining & Refining (1944) Ltd. and near the properties of Goldfields Uranium and Rix Athabaska Uranium. More than 200 radioactive occurences have been recorded in the area.

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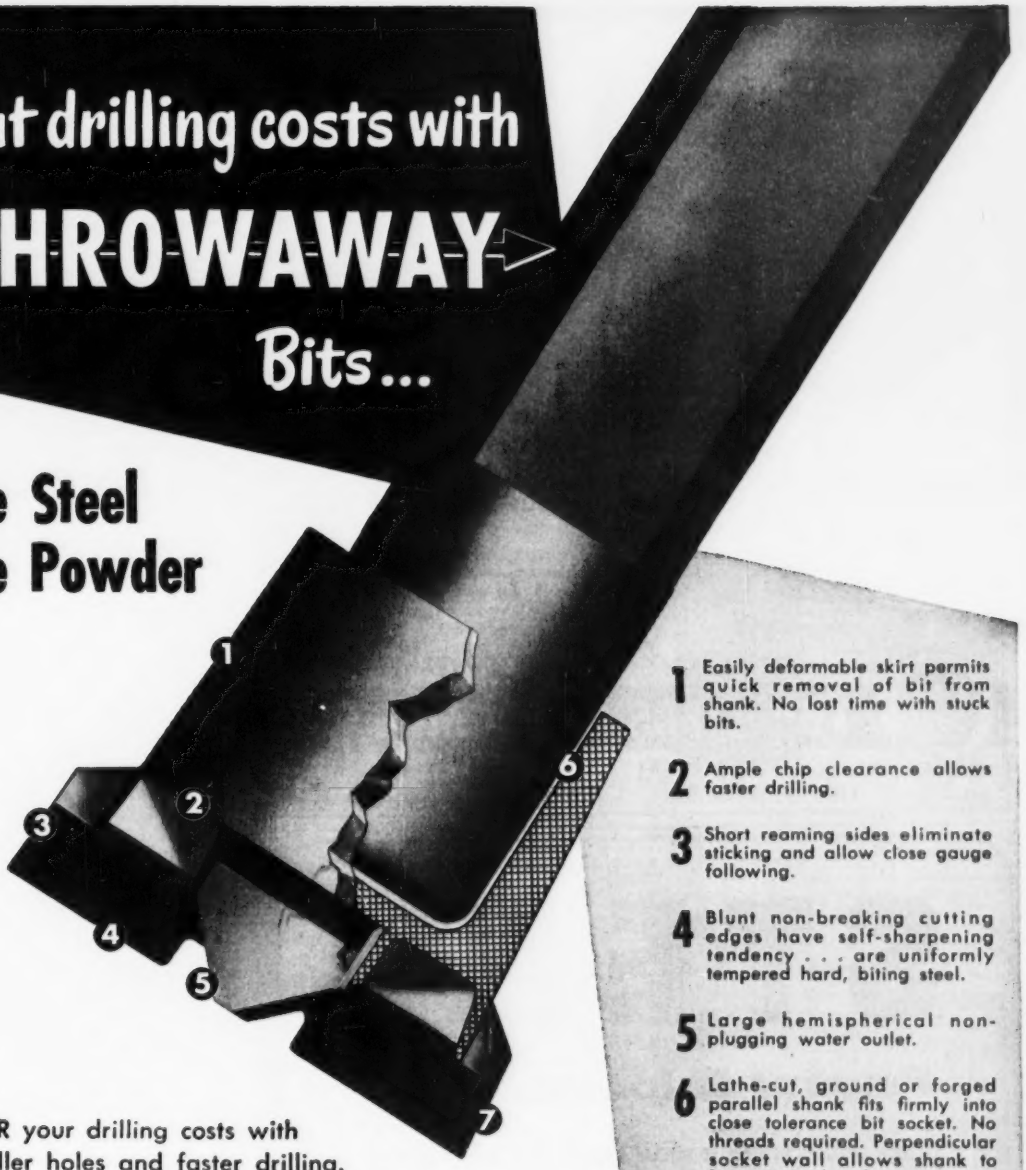

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Canada *(Continued)*

★**Estella Mines Ltd.**, which operated near Wasa, in the B. C. east Kootenay area, has acquired another uranium property, a 16-claim group adjoining the Rix Athabasca and Goldfields Uranium properties in the Beaverlodge lake area. Estella previously purchased nine claims near the Gunnar and Chimo properties.

★**Beta Gamma Mines Ltd.** plans to proceed at once with sinking of a three-compartment shaft at its uranium prospects north of the Rix Athabaska and Goldfields Uranium mines in the Beaverlodge Lake area. The shaft will provide access for the development of two known uranium-bearing ore zones on the Chum group.

★A record 4,151 mineral claims were staked in Saskatchewan during 1952, about 75% of them in the Lake Athabaska uranium area.

★Latest progress report on diamond drilling results at **Waden Bay** (about 150 mi. north of Prince Albert) show that both the "A" and "B" copper-gold ore zones have been lengthened 1,800 ft. and 1,700 ft., respectively, with both western and eastern ends of the zone still open. This property is being developed by Anglo-Rouyn Mines, Ltd.

In the "A" zone one hole penetrated 21.3 ft. of copper bearing ore, with a 10-ft. section assaying 2.22% Cu. A second hole penetrated a 25.4-ft. copper-bearing zone. In the "B" zone, a drill hole cut a 24-ft. zone of chalcopyrite mineralization, a 14-ft. length of which returned 2.58% copper.

YUKON

★Announcement has been made that a **resident mining inspector** and geologist for the Yukon will be appointed with headquarters in Whitehorse.

★W. M. Emery, president of the Whitehorse Branch, Yukon Chamber of Mines, reports that **1,500 quartz claims** were staked in 1952, compared with 491 in 1951. The following projects were reported: American Smelting & Refining Co. drilling on silver-lead-zinc property on Hyland Plateau; Anaconda Copper Mining Co. examining claims on upper White River; antimony ore deposits being developed on Carbon Hill in the Wheaton area; Burwash Creek placer continuing work on a new operation in Gladstone Creek; Cassiar Asbestos property on McDame Creek nearing production; gold properties being developed in the Mount Freegold area; Hudson Bay Exploration & Development Co., Ltd., drilling on a property at the head of Quill Creek, in Kluane Lake area; Prospector's Airways, Ltd., has taken an option on nickel outcrops in the Whitehorse district; Yukon Mines developing Idaho Hill mine in the Wheaton area; and Yukon Tungsten driving a raise from an earlier tunnel.

IN LATIN AMERICA

BOLIVIA

★The Convention of the **Movimiento Nacionalista Revolucionario** was held on Feb. 3 under chairmanship of Dr. Victor Paz Estenssoro, President of Bolivia, to re-state all political, economic, and social principles now guiding the new government.

"At the beginning of the revolution," declared Paz Estenssoro, "we terminated the old army oligarchy, and have nationalized the mines, and contemplated land reform and the universal vote.

"We must go far beyond selling raw ores," he continued. "We have to export our mineral products in ingot form. We must develop the big possibilities of our agriculture and cattle industries."

At the outset of the convention widely divergent views of left and right-wing elements were in evidence among the delegates, but these were reconciled considerably as the aims of the government became clarified.

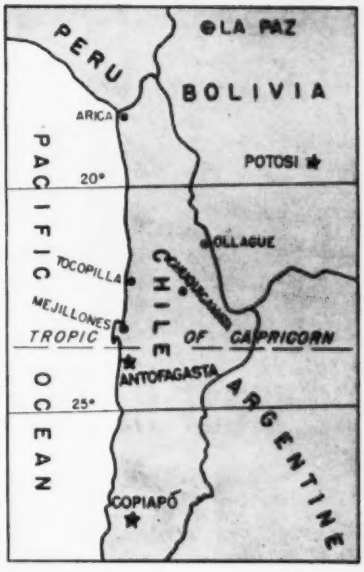
Juan Lechín, Ministero de Minas y Petroleo, first vice president of the convention, said that nationalization of the mines "is bringing hunger and sacrifice to all of us, but we have to face them stoically with the hope that all Bolivians and future generations shall achieve economic emancipation. All Bolivians must work to make a rich Bolivia with a poor budget into a rich Bolivia with a rich budget."

It was announced that the Army would be reorganized to achieve constructive objectives such as the building of bridges, highways, and railroads. Mine workers, who feared that a new army might be used to hold labor in line with physical force, were relieved to learn of this new objective for the army. The Worker's Army is also designed to balance a potential action by former army officers according to some delegates.

Budget plans call for a 50% cut in army appropriations, and a 55% increase in educational projects. The convention also approved the creation of a special commission to study land reform. On Feb. 12 the convention closed on a note of unity, and expressed its confidence in the leadership of Victor Paz Estenssoro.

CHILE

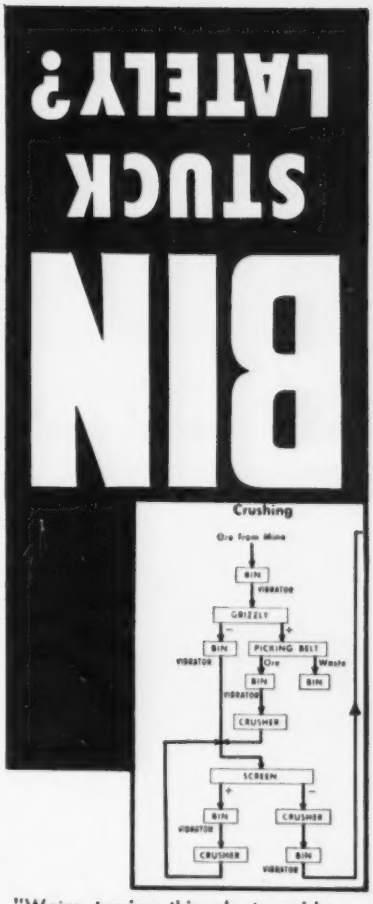
★**Sociedad Azufrera Polan** is importing from Germany at a cost reported to be equivalent to (U. S.) $300,000 a complete plant for beneficiation, by means of carbon disulphide, of sulphur ore taken from the company's property 30 mi. west of Ollague in El Loa department, Province of Antofagasta. Included is machinery to manufacture the carbon disulphide to be used to melt the sulphur. The deposit is at 16,000-ft. elevation. (Ollague—see map—is the last station in Chile along the Antofagasta-to-Bolivia rail line.)



The plant is thought to be the first to use the disulphide method on Chilean sulphur. All Chilean sulphur is of volcanic origin, hence not amenable to beneficiation by the Frasch process nor Italian processes entailing use of some of the ore's sulphur as a fuel to liquefy the rest.

★Sulphur residues at the Codocedo mines east of Copiapó (see map) in Atacama Province will be floated by **Sociedad Minera Condoriaco** to obtain an 80% sulphur concentrate that will be steam-treated in cast iron autoclaves to produce a 99.5%-sulphur brimstone. Condoriaco formerly treated gold-silver ores in the Condoriaco district by the cyanide method until the property's reserve was exhausted.

★While Chile holds fast to her place as **the world's second greatest producer of copper,** the ratio of world output produced here has been falling off steadily as expansion of capacity moves at a gallop in other parts of the world and foreign capital balks at increasing capacity here. In 1944, Chile produced 549,517 of 2,791,720 short tons, or 19.7%. In 1951, her output was 418,572 of 2,898,839 short tons, or 14.4%. Chuquicamata's (see map) new flotation mill and smelter doesn't so much add to output tonnage as it does replace production of the old leaching plant. (Combined output of sulphide and oxide plants is expected to be about 0.5-billion lb. a year.) Andes Copper Mining Co.'s oxide plant's been down two years now, and grade of the sulphide ore coming out of its mill has been getting progressively poorer. Meantime, 11 new projects in the U. S. will



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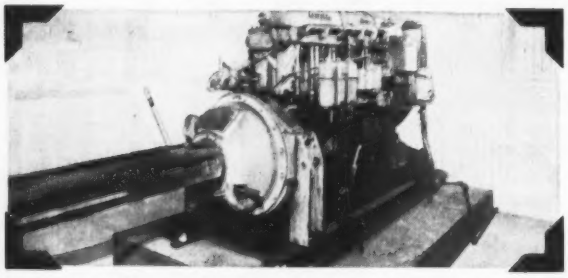
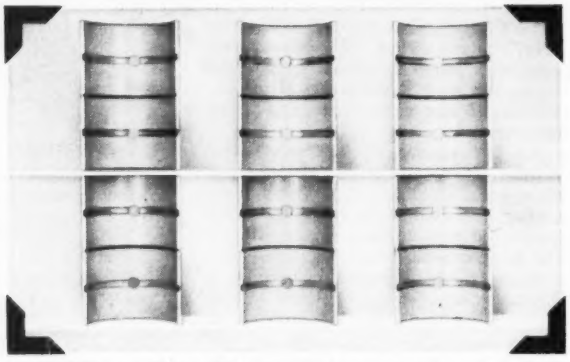
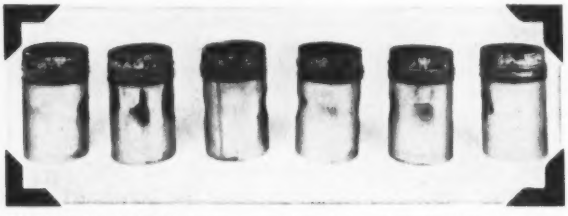


WORKING UNDER A CONSTANT LOAD pumping water, this D13000 diesel on the Dean H. Thayer ranch, Mesa, Arizona, ran 7650 hours before it was overhauled. An emergency made it necessary to run the engine for several days without safety cut-offs. Severe over-heating caused the governor to stick and the unattended engine reached a speed of approx. 1800 r.p.m. before it could be shut down.



OPERATED ON RPM DELO Supercharged-2 Lubricating Oil during the 7650 hours, con rod bearings showed only 0.001" greatest wear. There was no pitting and all parts were unusually clean.



NO MEASURABLE WEAR was evident on the pistons which showed original tool marks. Greatest wear on liners was 0.005. Piston rings were all free, oil rings were open. After inspection, main bearings, crankshaft, cam & cam bearings, piston pins and bushings were all put back in service.

REMARKS: This engine operates year 'round in widely varying temperatures. In wintertime, the irrigation water is used to prevent the crops from freezing.

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Chile *(Continued)*

increase that country's copper capacity on the order of a quarter-million tons a year, old Rhodesian mines are expanding and new ones developing, and the trend of expansion is well marked in Katanga and other parts of Africa, in Peru and Turkey.

★**Meager road and rail facilities** have been hampering prospecting and development of the potential mineral wealth of Africa department in the extreme north (see map).

★Blister production of **Mining Bank of Chile's Paipote copper smelter** rose to 1,139 tons in December to bring 1952 total to 9,078 metric tons containing 15,000 oz. of gold and 134,000 oz. of silver. Paipote's blister is refined at **Norddeutsche Affinerie** in Hamburg, Germany.

★Consternation is evident in mining circles here lest the recent drop in the peso's exchange rate from 125 to 110 to the dollar, drive the Mining Bank to **curtail its ore-purchasing program.**

★**Cia. Minera Disputada de Las Condes'** strike of several weeks was settled on the basis of a 35-peso-per-day hike and other benefits. The company mills 550 tons a day of 2.8% copper ore to produce concentrate grading 31% copper.

COLOMBIA

★**Pato Consolidated Gold Dredging Ltd.,** subsidiary of Placer Development Ltd., Vancouver, B. C., operating on the Nechi River, recovered 34,354 oz. gold valued at $1,202,390 ($35 U. S. per oz.) from 5,228,500 yd. or 23¢ per yd. in the three months ended Dec. 31.

★**Nechi Consolidated Dredging Ltd.,** subsidiary of Placer Development Ltd., Vancouver, B. C. also operating on the Nechi River, recovered 3,200 oz. from 1,019,000 yd., value $112,000 ($35 U. S. per oz.) for an average value of less than 11¢ per yd. of gravel, during the three months ended Dec. 31.

★**Aznazu Gold Dredging Ltd.,** subsidiary of Placer Development Ltd., Vancouver, B. C. dredging along the Upper Cauca River, recovered 4,213 oz. gold from 1,671,900 yd. of gravel, or 8.82¢ per yd., for a value of $147,455 ($35 U. S. per oz.) in the three months ended Dec. 31.

★A new company **Asbestos Colombiana S.A.,** with a capital of one million pesos (U.S. $400,000) was founded with Instituto de Fomento Industrial, Bogota, and Johns Manville Corp., Canada, as principal shareholders. The latter firm acts as technical expert in the exploration of the asbestos deposits of Campamento, Anori and Valdivia in the Antioquia Department. Exploration of the deposits, which have so far been satisfactory, are to

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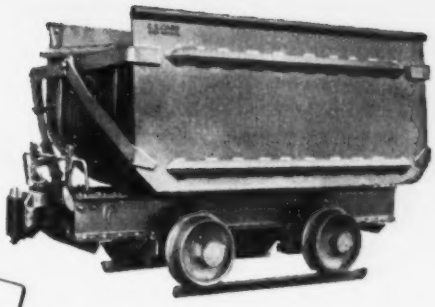

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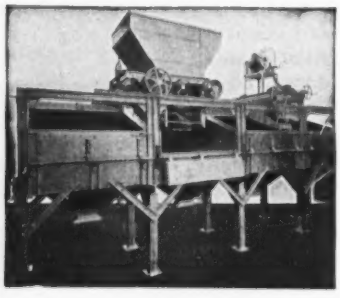

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Colombia *(Continued)*

be completed this year. The size of the plant will then be determined, but it is believed that exploitation of the deposits will not only supply the home market, but also leave a substantial amount for export.

CUBA

★New mineral claims (land-staked) in Pinar del Rio Province as registered in the government's mines office in February include:

1. One-hundred hectares of land (sulphur) in the name of Michael J. Poliakoff, whose address is given as the Hotel El Presidente, Havana. It is in the region known as "Bajo de Pizarro" in the barrio of La Fe municipality of Guane.

2. Roberto Gonzalez de Mendoza y Vinent, Cuban (no address), 1,059 hectares of land (copper, iron) to be known as "Mendoza Segunda," in the barrio of Los Arroyos, municipality of Mantua. Another 1,040 hectares of land (copper, iron) to be known as "Mendoza Primero" in the same area.

3. Jacinto Manuel Argudin, Cuban agricultural engineer (Maceo No. 66, Pinar del Rio), 100 hectares of land (suspected uranium deposit), to be known as "Ruis Rivera," in Cabo de San Antonio, municipality of Guane.

4. Dr. Antonio Avila y Gonzalez, lawyer, Calle Monte No. 408, Havana, 400 hectares of land (iron, copper) under the name of "La Caridad." In the barrio of Lomas, municipality of Candelaria.

5. Gregorio Reyes of Matahambre, Pinar del Rio, 25 hectares of land (manganese), name of "La Caridad," in the barrio of Santa Lucia.

★National Ores Corp., Havana, Cuba, is reported to be developing a large high-grade iron-ore property in Pina del Rio Province. Shipments will be made to the United States.

MEXICO

★**National output of sulphur** will easily reach from 500,000 to 600,000 tons a year when projects near the port of Vera Cruz and on the Tehuantepec Isthmus, in Vera Cruz and Oaxaca, reach completion. So a Canadian trade mission was told at a banquet given them recently by Jorge Espinosa de los Reyes, director of the Banco Nacional de Mexico's department of economic studies; Gerardo Lopez, Pemex export manager, and other Banco Nacional officials. Last year's production was about 62,000 tons, of which 40,000 came from Pemex' Poza Rica oil fields in Vera Cruz.

★Bank of Mexico announced **1952 production of silver** was 45.5-million fine oz., up 1.2-million from that of the year previous. The Bank bought 41-million oz. last year.

★Justino Riva Palacio, of Durango City, says he's **uncovered high mercury values** in long-idle mines at Colonia de San Angel in Cushcame municipality, Durango, and would set up smelter capacity to produce 250 kg. (about 7.7 flasks) weekly.

★The Ministry of Defense posted troops to guard the Guadalupe mine in Morelos municipality, Chihuahua, when prospectors who are cooperatively working the mine complained recently to the Attorney General's office that tungsten was being systematically pilfered from the mine and **smuggled to the other side of the Iron Curtain.**

★Louis Giese, Phoenix, Ariz., miner who's been **prospecting the Sierra Madre Oriental region in southern Nuevo Leon** for 15 months, told the Monterrey (Nuevo Leon) Chamber of Commerce he'd found considerable gold contained in pyrite, promising indications of silver, lead, zinc, manganese, iron, and encouraging deposits of sulphates and carbonates. He further reported a natural gypsum tract 125 mi. long, 20 ft. wide, in layers as much as 30 ft. in depth.

★The federal government has agreed to extend **credit to Aguascalientes** to stimulate mining by small-scale operators. The measure was taken in response to Federal Senator Pedro de Alba's appeal to Secretary of National Economy Gilberto Loyo. Alba said that in view of declining agricultural productivity, the relief measure would be required to bolster Aguascalientes' economy.

PERU

★**Low lead and zinc prices** are being felt by Peru's mining industry, and some new enterprises that do not have strong financial backing may have to shut down, at least temporarily. Despite lower prices for 1952, as compared with 1951, observers believe that a new record mineral production for 1952 will be set when official production figures are compiled.

★According to a contract signed with the Corporacion Peruana del Santa, the **Marcona Mining Co.** is developing the Marcona iron deposits estimated to contain more than 100-million tons of high-grade iron ore. Port installations as well as housing and other facilities are being built. Operations are expected to start within the next three or four months. This ore is to be shipped to the U. S. until the Corporacion del Santa finishes the electric furnaces at Chimbote where part of the iron ore will be smelted.

VENEZUELA

★**Four German technicians** hired by the Venezuelan Development Corp., are in the iron-producing region of Guayana (State of Bolivar) to investigate possibilities for a national steel industry.

The group is composed of Dr. E. Hilgenstock, director of steel industries in the Ruhr district; Dr. S. Kauth, expert on smelting processes; Dr. F. Grass, metallurgical authority; and O. Schmitz, mineralogist.

★**The Venezuelan national dream** of a steel industry has the sympathy of Benjamin F. Fairless of U.S. Steel Co. Fairless told the Venezuelan Iron Syndicate recently that he considered it a natural aspiration, and that U.S. Steel would offer full technical collaboration in the preparation for a complete study of the possibilities for a Venezuelan steel industry.

"This is an aspiration that I readily comprehend," Fairless said. "I hope and believe that it can be realized. But it will require very careful study and planning, and it will not be easy. Nor will it constitute a direct source of great return in a strictly monetary sense, at least while the factors which presently govern the manufacture of steel exist."

Steel is one of the cheapest metals available, but expensive to produce, Fairless warned. The capital investment required for the production of steel is enormous and the cost of building and operating a steel mill would result in extremely small profits—especially at prices prevailing in world markets.

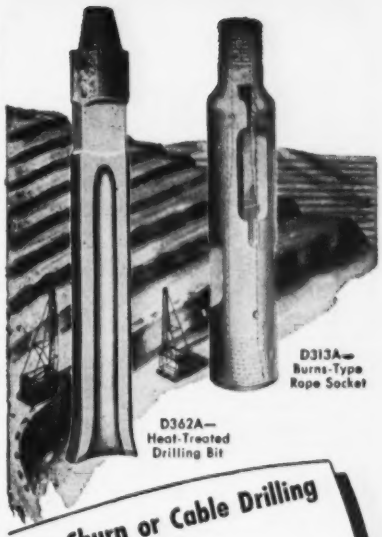
But despite the dim financial outlook, Fairless said a national steel industry would prove advantageous to Venezuela by creating new jobs, new outlets for natural resources, and proving a dependable and accessible source of steel to meet the nation's home demand.

Fairless said that the future development of the state of Bolivar really is "incalculable." When the dredging of the Orinoco River, vast project undertaken by U.S. Steel to provide access to the sea for shipping Venezuelan iron to the U.S. is complete, Fairless said, "new farms and pastures will be created and certainly will stimulate the development of part of your riches and virgin forests. New explorations and exploitation of mineral reserves in the area will be made . . . and with new low-cost shipping and abundant hydroelectric energy, the valley of the Orinoco will offer unlimited opportunity for new industries of all kinds."

Thus far, the executive announced, U.S. Steel has spent more than $60-million on the vast project.

IN ASIA

★Despite the Indonesian Government's nationalization of **the Banka Island tin mines,** the joint Billiton-State mining company will continue to work the Billiton Island tin mines. The joint company, Gemeenschappelijke Mijnbouw Maatschappij Billiton, is owned five-eighths by the Indonesian Govern-



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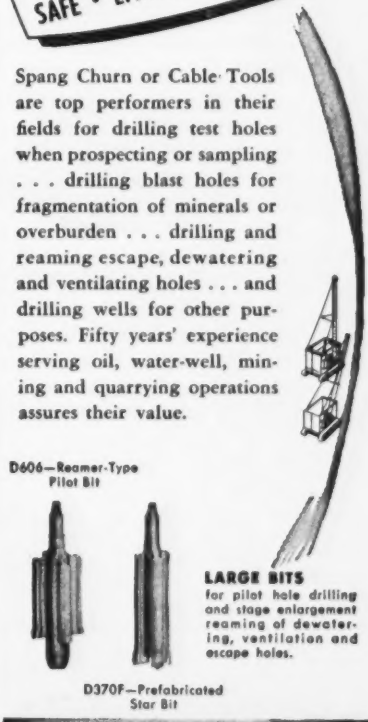

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So perfectly fitted to his environment is the bullfrog that for millions of years he has survived the rigors of evolution, the ravages of his enemies. He is at home in water, mud or on dry land. He can survive extreme heat and bitter cold. He is a perfect example of perfect design for a rugged environment...*as is the Skookum Slusher Block*. Here is a block designed to perform flawlessly in water, muck and silt without down-time. It's rugged, non-wearing, non-fouling. It's the exclusive choice of more and more mine operators.

THE SKOOKUM COMPANY, INC.
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Asia *(Continued)*

ment, and three-eighths by the Billiton company.

The Banka tin mines have been completely in the hands of the government since expiration of the so-called Billiton contract Feb. 28, when the joint company ended its operation of the mines. As far as Billiton company is concerned, however, the contract by which the joint company operates the Billiton Island mines has been renewed. The management in The Hague said renewal was for five more years, and that agreement in principle had been reached for eventual renewal after Feb. 28, 1958.

★Cabinet ministers in Japan decided upon a plan early in March to **free the sale of all gold** excepting a certain amount required by the government.

Under the present law, the government purchases all gold produced in Japan at 101 yen per gram, selling about one-third to consumers at 515-yen per gram through fixed channels.

The free-trade plan, if approved by the Diet, will allow gold producers to sell two-thirds of their production freely after April 1, and the government will purchase the remaining third.

★In late February the United Kingdom was showing increasing interest in **Japanese silver bullion.** Asking price for the silver was reported to be about 9,640 yen per kilogram. It was also reported in the Japanese press that Sumitomo Metal Mining Co. signed a contract to ship 1,500 kilograms to London.

★Two cases of tie-ups between Japanese and Philippino firms for the **development of copper resources** in the Philippines have been reported in Japan recently. In one between the Elisalde Co. and the Mitsui Metal Mining Co., the latter company will give technical assistance for the development of Siparai copper mine on the Negros Island. In the other, between the Soriano Co. and the Mitsubishi Metal Mining Co., Mitsubishi is to give technical guidance for the development of a gold mine on the Masbate Island, and the Toledo copper mine on Cebu Island. Engineers for both projects have been sent to the Philippines.

★**Three major steel makers** in Japan, Yahata and Fuji steel mills, and Japan Steel Tube, are suddenly showing deep interest in the possibility of developing iron mines in Portugese Goa on the western coast of India in cooperation with owners there. A five-man study team has been sent to Goa to survey the situation. This sudden interest was shown as a result of the failure of another project for setting up a steel mill in India jointly by Japanese and Indian industrialists.

★**Japan's output of iron and steel** in 1952 reached only 83% of the target set by the Ministry on International

non-blinding Screens

• • • there is only one point—one fine point — of contact between top and tie rods in the exclusive BEE-ZEE round rod design. It offers no "pockets" for moisture and dust to collect. There's no blinding or clogging—even on the highest moisture materials. Think what this can mean in terms of a smoother, more profitable screening operation!

only one fine point of contact.....

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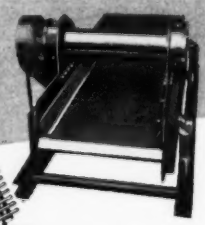
Round top rod screen openings change in size only after worn halfway through! Stainless steel rods will not rust or corrode... built-in screen tension means greater efficiency, easier installation. Small wonder, then, that coal operators report 10, 20—even 30 times longer wear with BEE-ZEE Screens.

BEE-ZEE Screens can be tailored to your needs. Send us your requirements. Ask for FREE catalog. No obligation.



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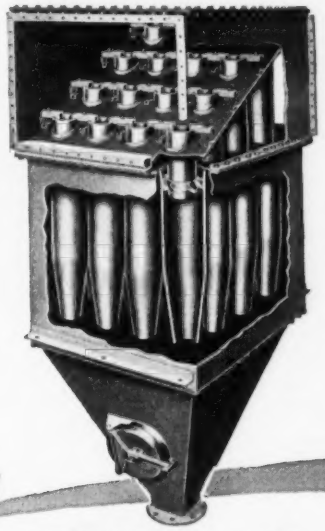
Before you buy *any* equipment for recovering dust . . .



COMPARE ALL OTHERS against MULTICLONE'S Multiple Advantages

Because the advantages of MULTICLONE are so clear-cut, so vitally important, so far-reaching in the savings they make, we urge you to make a factual unbiased comparison of MULTICLONE dust collection equipment against *any other* in the mechanical recovery field. Only by making such a comparison can you fully appreciate the major savings and greater performance you get by installing MULTICLONE Collectors!

COMPARE Recovery Efficiency!

It is a recognized fact that the separating efficiency of a cyclonic tube *increases* as the tube diameter *decreases* because smaller tubes generate greater centrifugal forces. The patented vane in the MULTICLONE makes the use of small tubes *practical* without complicated manifolding and permits compacting many small tubes into one simple, highly efficient unit. MULTICLONE's higher centrifugal forces throw out not only the large, medium and small particles, but also an unusually high percentage of the *extremely small* particles of 10 microns and less. Result—*more complete recovery of all suspended particles from the gas stream!*

COMPARE Space-Saving Compactness!

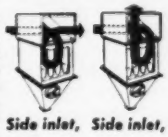
Plant space costs money—particularly at today's high construction costs. Because the MULTICLONE is more compact, size for size, it makes *really important* savings in space and plant costs. Note in the chart how the MULTICLONE requires substantially less space—*both in floor space and cubic space*—than any other unit of comparable capacity and performance. *This means vital savings in construction costs!*

Make	Relative Space Requirements In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9

COMPARE Dollar-Saving Adaptability!

Savings in space is just one of many ways MULTICLONE reduces installation costs. Because the shape of the unit can be readily varied (long and narrow, short and wide, or square) to fit available spaces, the MULTICLONE can often be tucked into odd corners and waste areas too restricted for other equipment.

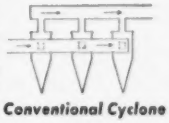
Moreover, inlet-outlet ducts can be varied—side-inlet side-outlet, or side-inlet top-outlet—to meet low headroom or restricted side clearance requirements . . . and the single-inlet single-outlet duct design permits greater flexibility and simpler installation. *These all add up to vital savings in installation costs!*



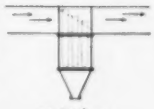
Side inlet, Side outlet ***Side inlet, Top outlet***

COMPARE All-Around Simplicity!

The MULTICLONE is simple and inexpensive to maintain because there are no highspeed moving parts to repair or replace . . . no pads or filters to clean or renew . . . nothing to choke the gas flow or increase draft losses as suspended materials are recovered. In addition, the square, flat-sided shape of the MULTICLONE and its straight inlet and outlet ducts are far simpler to install and insulate. And since the recovered material from an entire bank of tubes is collected in a *single* hopper, it is much easier to service and maintain than the multiple hoppers of conventional cyclone units. *Here again, the* MULTICLONE *saves in many ways—all of them important!*



Conventional Cyclone



Multiclone

Whether your recovery installation is in a new structure or for modernizing present equipment, you will be far ahead by installing MULTICLONE Collectors. Our experienced engineers will gladly make helpful suggestions for simplifying your recovery problems. A letter, wire or call to our nearest office places this assistance at your service without obligation.

Send for Helpful Literature! This factual MULTICLONE literature explains the basic principles of cyclonic dust recovery and gives technical data helpful to anyone contemplating a dust or fly ash recovery installation. Write today for your free copy!

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FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs

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FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
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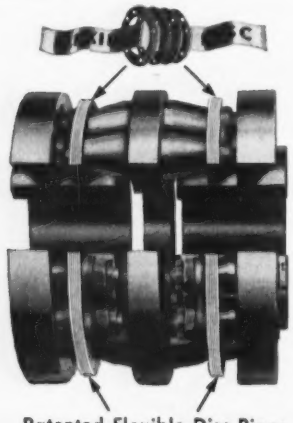
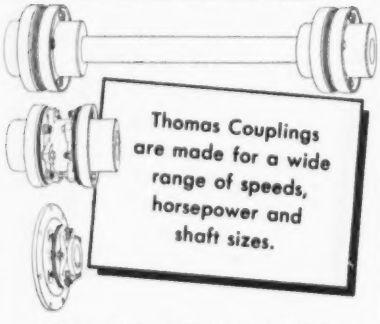


Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.



Thomas Couplings are made for a wide range of speeds, horsepower and shaft sizes.

THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

NO MAINTENANCE PROBLEMS

ALL PARTS ARE SOLIDLY BOLTED TOGETHER

Write for our new Engineering Catalog No. 51

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

Asia (*Continued*)

Trade and Industry. Pig iron output was 3,530,000 tons, and steel ingot production was 6,135,000 tons.

INDIA

★The Prime Minister of India inaugurated a government-owned **rare earth processing plant** at Alwaye, Travancore Cochin, to process 1,500 tons of monazite sands found annually on the beaches of the state. Main products of the plant will be rare-earth chlorides and carbonates, and by-product thorium compounds.

★**Indian Aluminium Co.** will build an aluminum reduction plant at Hirakud, (Orissa), scheduled to go into production in 1956 with capacity of 10,000 tons a year, later to be doubled, and will double output, now 2,500 tons a year, of its Alwaye unit in Travancore-Cochin State, while Aluminium Corporation of India will increase output of the Asansol, West Bengal, plant from 2,000 to 2,500 tons a year. These measures are being taken in connection with the Indian Government's recent authorization for an increase from 5,000 to 17,500-tons-a-year capacity and announcement it would shoot for 20,000-ton capacity by 1956. The government put the subcontinent's bauxite reserve at roughly 250-million tons.

IN AUSTRALIA

★**Preliminary estimates** indicate that metal production from Australian mines for 1952 was as follows: copper, 16,500 tons; zinc, 86,000 tons; gold, 780,000 oz.; tin, 1,700 tons; lead, 165,000 tons; silver, 6.9-million oz. Recent reports indicate that large base metal mining companies are producing at a higher rate in the current fiscal year. For the first 28 weeks of the current financial year electrolytic zinc produced 46,383 tons of zinc at its Risdon works as compared with a previous 28-week output of 42,893 tons.

Mount Morgan's production for the first 28-week period of the current financial year was: 37,258 oz. of gold, 3,618 tons of copper, and compared with 35,837 oz. of gold and 2,928 tons of copper for the preceding 28 weeks.

★**A new uranium find** is reported from Northern Territory where a trio of prospectors discovered uranium a few miles east of the Edith River deposits discovered last year.

★**The Gold Producers Association, Ltd.**, which handles the "free market" sale of Australian gold announced that its average price of sale was slightly more than $2 above the official price. The net currency gain to Australia was just below $2-million.

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Portable
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Cross section at left shows how KLEENSLOT Screens operate on a non-clogging principle.

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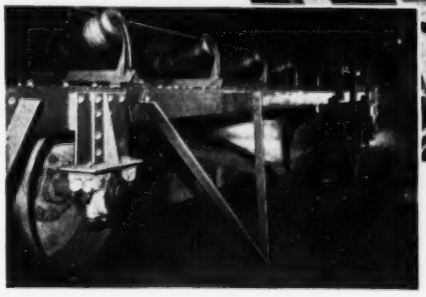
How does U. S. Rubber's twisted belt handle wet ore?

BELT BEING TWISTED as it leaves vertical gravity take-up before running over return idlers.

(right) GENERAL VIEW of belt carrying iron ore from crushers to stock pile. (Mather Mine, "B" Shaft of the Negaunee Mine Co., operated by the Cleveland Cliffs Iron Co., at Negaunee, Mich.)



RETURN STRAND of belt being twisted before reaching tail pulleys.

PRODUCT OF U.S.RUBBER SERVING THROUGH SCIENCE

This belt is twisted behind the head pulley to make the clean side of the belt run against the return idlers, preventing wet iron ore from building up on them. The belt is twisted again before it reaches the tail pulley, so that the load is placed on the carrying side of the belt. Installed at a mine in Michigan's Upper Peninsula, this U. S. Matchless belt is 1425 feet long, 36 inches wide. It is used to stockpile ore above ground.

United States Rubber Company engineers have the research facilities and the experience that enable them to build the right kind of belt for your needs. They are specialists in reducing haulage costs and raising output. Write to address below.

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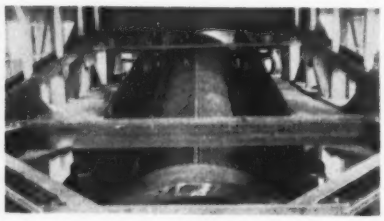
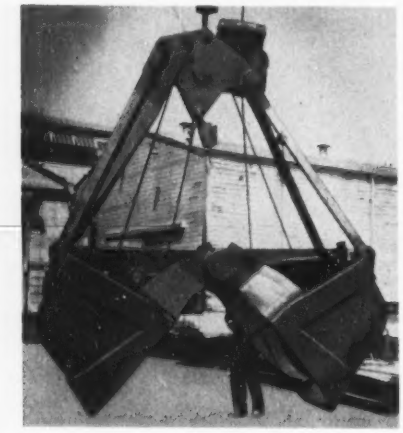
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

YUBA Bucket Ladder Dredges for dredging placer properties including rare earths, etc.; handling sand and gravel, dam construction, channel changes, etc., Bucket sizes: 2½ to 18 cu. ft. or larger. Digging depths below water as required.



YUBA Abrasion Resisting Steel Screens—Flat or revolving for separating, scrubbing, sizing. Holes taper drilled to prevent clogging. All thicknesses from ¼" up; other dimensions as needed. U·S·S· AR plate carried in stock.



Stockton "Yubabilt" Clamshell Buckets, for channel, harbor and reclamation dredging. Two types: California and Power Arm (shown here). Three weight classes: heavy, standard, special light weight. ½ to 6 cu. yds.

YUBA DREDGES — PROVED DEPENDABILITY AROUND THE WORLD

57

YUBA MANUFACTURING CO.

Room • 351 California St. • San Francisco 4, Calif.

Australia *(Continued)*

★**Great Western Consolidated N. L.,** which is being groomed as Australia's greatest gold producer, announced improvement in its production returns, and its grade of ore rose from 2.09 dwt. to 2.75 dwt. per ton. The mine has started production recently.

★The **recent fall in the tungsten price** will not affect Australia's large producer, King Island Scheelite, Ltd., whose long-term contracts with the U. S. and Britain provide for prices exceeding current world prices.

★**Victoria's gold production** for 1952 was 68,628 oz., 9,673 oz. higher than in 1951.

★**Mt. Isa Mines, Ltd.,** has started producing 25 tons of copper daily. This will be increased to 40 to 50 tons per day.

★**The Warburg banking interests** of New York have registered a claim to all mining rights in 5,000 sq. mi. in New Guinea, including the rich Bulolo field belonging to Placer Co. Their claim is based on rights granted by the old Imperial German Government to Warburgs in 1914. This case will probably go to the International Court.

★**Snowy Mountains Mines N. L.** reports a new wolfram-bismuth lode about 12 in. wide and carrying good values. The new lode is near five main lodes.

★**Mount Lyell production** for the first quarter of its financial year was 2,491 tons of copper, 7,271 oz. silver, and 1,592 oz. of gold.

IN THE PACIFIC

PHILIPPINES

★**A comparison of operating results of straight gold producers** during January, 1953 and the same month a year earlier reveals several important changes. Three new mines have been added to the list, Baguio Gold, San Mauricio, and United Paracale, bringing the total to 10. Substantial increases in the monthly rate of tonnage milled and bullion produced were made by most mines, notably by Benguet, Balatoc, and Itogon in the Baguio area, but peso realization was adversely affected by a lower price for gold sold in the open market, which averaged 109 pesos per oz. as compared with 117 pesos in January, 1952. San Mauricio milled the highest-grade ore of all mines reporting during the month, averaging about $21.50 per ton at the statutory price. The salient figures appear in table below.

During 1952, **Benguet Consolidated** milled 465,117 tons of ore at the central mill and Balatoc 482,950 tons. Benguet ore averaged $7.60 per ton at the statutory price, somewhat higher in grade than Balatoc, with $7.15 per ton. Total gold production for both mines was 196,100 oz. Both companies realized 28,124,000 pesos for their bullion in 1952, or an average of about 143 pesos an oz. Ore reserves were well maintained, totaled about 4-6-million tons at the end of 1952 as compared with 4.54-million tons a year earlier. Ralph W. Crosby is general manager for both companies.

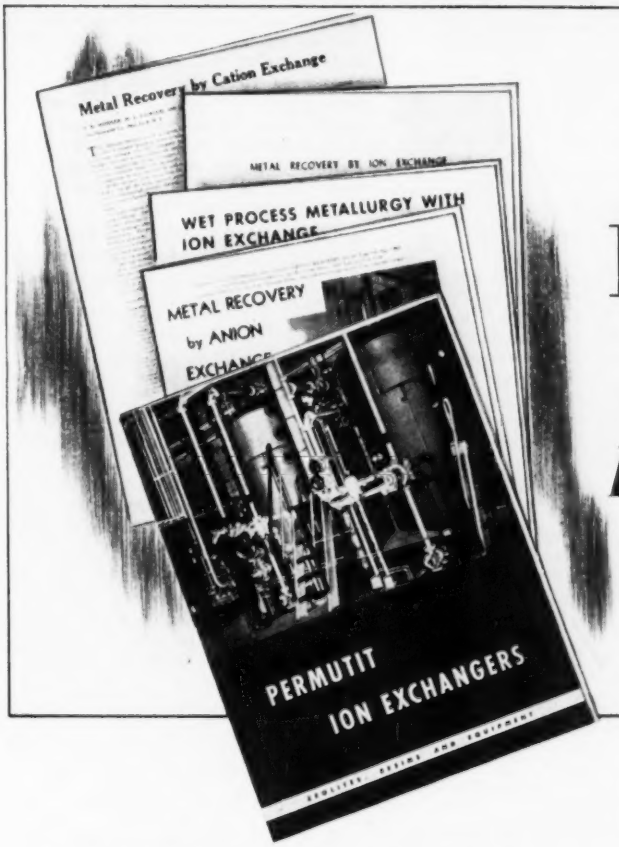
Lepanto Consolidated produced 3,887 tons of concentrates in January, with a net value of $839,000. Concentrates averaged 29.6% copper and 0.8 oz. gold per ton. Ore milled during the month totaled 31,244 tons averaging 4.0% copper and 0.135 oz. gold per ton. Copper recovery was reported 91.1% and gold 74.2%.

Gold producers expect to benefit in 1953 from approval by the House Ways and Means Committee of a proposal to abolish the ad valorem tax on gold production, ranging from 1½ to 10%. Another bill filed would eliminate royalty on gold production. Little hope exists, however, that the gold mines will be exempted from the 7% compensating tax on imports of equipment and supplies, or from the 17% excise tax on foreign exchange. It has been pointed out officially by the Bureau of Mines that during the first half of 1952 the gold mining industry had operated under severe handicaps which, unless allayed, would force closing most mines and throwing more than 9,000 men out of their jobs. The Bureau asks that new gold mines and old ones that resume operations should be exempted from the corporate income tax for three years, as is done in Canada.

Itogon Mining Co. has installed a chlorine-process gold refinery which will permit production of bullion 990 fine. Such bullion commands a considerably higher price on the Manila

Mine	Tons Milled		Value @ $35/ oz.	
	Jan. 1952	Jan. 1953	Jan. 1952	Jan. 1953
Atok-Big Wedge	14,406	13,180	$ 85,180	$150,400
Balatoc	40,446	44,361	306,700	432,460
Benguet	35,071	42,800	261,000	478,800
Coco Grove	123,000*	148,000*	16,900	10,600
Itogon	11,901	14,669	114,260	142,240
Mind. Mother Lode	10,800	11,300	163,350	126,800
Surigao Cons	12,049	13,400	174,000	236,000
San Mauricio	—	8,635	—	136,250
United Paracale	—	4,945	—	71,300
Baguio Gold	—	10,183	—	121,800

*cu. yd.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METAL RECOVERY *by Ion Exchange Processes*

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Permutit – the leader in Ion Exchange – is uniquely equipped to cooperate with you in developing these techniques to meet your requirements. Permutit Ion Exchange equipment and resins are widely used in many metal recovery and purification applications closely related to your leaching operations.

The bulletins listed at left describe several successful applications of Ion Exchange techniques which might be applied to the field of hydrometallurgy.

Wet Process Metallurgy with Ion Exchange – A technical bulletin describing the background of ion exchange, briefly discussing past work in the application of ion exchangers to metal recovery and suggesting numerous additional commercial possibilities in hydrometallurgy.

Metal Recovery by Ion Exchange – Interesting technical bulletin outlines the recovery of metals from dilute processing solutions containing metals as well as precious metal recovery by anion exchange.

Metal Recovery by Cation Exchange – This paper reports two unique processes: The recovery of tin from sodium stannate solutions and the recovery of metal cations from acidic solutions.

Metal Recovery by Anion Exchange – A report on the recovery of chromium, gold, iron, molybdenum, palladium, platinum, and vanadium, in the form of complex anions, from dilute solutions.

Permutit Ion Exchangers – A 12-page bulletin summarizing the properties of Permutit Ion Exchangers and applications ranging from the treatment of water to the recovery of metals from solutions, the separation of rare earths, etc.

CLIP THIS COUPON FOR INFORMATION

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330 WEST 42ND STREET, NEW YORK 36, NEW YORK
Please send me the literature checked below:

- ☐ Wet Process Metallurgy with Ion Exchange
- ☐ Metal Recovery by Ion Exchange
- ☐ Metal Recovery by Anion Exchange
- ☐ Metal Recovery by Cation Exchange
- ☐ Bulletin—Permutit Ion Exchangers

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Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

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Philippines *(Continued)*

open gold market. Clarence A. Weekly is general superintendent of Itogon and chief metallurgist for Marsman & Co., which operates the property.

IN AFRICA

★The first gold bar will be poured at **Freddies South** probably in the first few days of next month. Since the shaft was sunk, development of sections and headings has proceeded more rapidly, it's said, than any other development work undertaken to date in the Orange Free State gold fields. Initial operation will be at about one-third of capacity, and the pace will be stepped up as development and labor recruiting permit.

★**Recent wage increases** for African workers in Northern Rhodesian copper mines may seriously affect wages elsewhere in Africa. It is also feared that workers may be drawn from other industries and farms in Rhodesia. In South Africa the flow of African labor to gold mines may be reduced as a result of the Rhodesian wage boost, and it is possible that higher wage demands may follow. The cost of the Rhodesian wage increase to copper mines is estimated at $2.1-million a year.

★**Eighty-thousand more African workers** will be needed if gold mines under development in South Africa are to be brought to full production, according to H. F. Oppenheimer, chairman of many mining companies in the Anglo American group. Existing mines are operating with about 77.5% of their labor requirements.

★**Work has finally ceased** at the Modderfontein Deep—one of the most famous gold mines of the Witwatersrand.

★**The collapse of the antimony market** has caused curtailment of operations at South Africa's main producer, Cons. Murchison in the Northern Transvaal. During the last quarter of 1952 tonnage milled dropped from 23,670 to 19,984.

★**Rhodesian European miners** have informed the Northern Rhodesian Government that a dispute exists, and that they intend to go to arbitration. The Miners Union claims that transfer of artisans from day work to shift work, and the employment of outside contractors whose rates and conditions do not conform with labor agreements are objectionable.

★**British mining companies** in Nigeria are stepping up production of columbite. The U. S. Defense Materials Procurement Agency is now paying $7,000 per long ton for Nigerian columbite. Production of Gold and Base Metal Mines operations will rise to over 80 tons this year, and to 150 or more in 1955/56. 1952 output was 26 tons.

★According to latest statistics the assets of the entire South African mining industry at the end of 1951 amounted to **more than $1.4-billion,** including $1.002-million in gold mines, $137-million in diamond mines, $135-million in collieries, and about $100-million in other minerals. Appropriations for capital expenditures were $220-million.

★A plant to **refine uranium ore** began operations this month in Madagascar. The plant will treat native ores for shipment to France.

IN EUROPE

★**West Germany's aluminum production** in 1952 totaled 100,462 tons compared with 75,134 tons in 1951. The plants of Vereinigite Aluminiumwerke produced 72% of the total and the Rheinfelder plant the remainder.

★**The iron mine at the Otanmaki** ore field, Finland, will go into production within a few months. The ore contains 37% iron, 7% titanium, and 0.25% vanadium. Ore reserves are reportedly large enough to last for 50 years on the basis of an annual production of 175,000 tons of iron concentrate, 75,000 tons of titanium concentrate, and 5,000 tons of pyrite concentrate.

★**Swedish iron ore shipments** along the Ofot railway to the Norwegian coast at Narvik will be increased from 9-million tons to an estimated 15-million tons annually as the result of improved rail equipment now being installed.

★**The Turkish Eti Bank,** employed by the State to exploit mineral deposits in Turkey, has announced the following production goals for 1953:

Coal	3,175,190 tons
Lignite	823,130 tons
Chrome ore	175,000 tons
Iron ore	330,000 tons
Copper	23,335 tons
Sulphur	7,000 tons

NEW BOOKS

Manual of Photogrammetry, Second Edition. Chapter headings of this handbook include the following subjects: the development of photogrammetry; elements of photogrammetric optics; cameras; aerial photography; photographic materials and laboratory techniques; basic mathematics of photogrammetry; field surveys for photogrammetry; preparation of aerial mosaics; elements of stereoscopy photogrammetric plotting instruments; mapping from oblique photographs; definitions, and a ready reference list. Published by the American Society of Photogrammetry. Available at Deputy Chairman, Manual Sales Committee,

P. O. Box 286, Benjamin Franklin Station, Washington 4, D. C. Pp. 876. Price to members $9, to nonmembers, $12.50.

1953 Black Market Yearbook. By Franz Pick. This book is an unfortunate chronicle describing thirteen years of world-wide black market activities. Its facts are based on illegal trading of currencies, gold, nonferrous metals, and steel castings. The global transactions rose from approximately $10-billion in 1951 to at least $12-billion in 1952. Once more, all existing historic records of financial and commercial law-breaking have been surpassed.

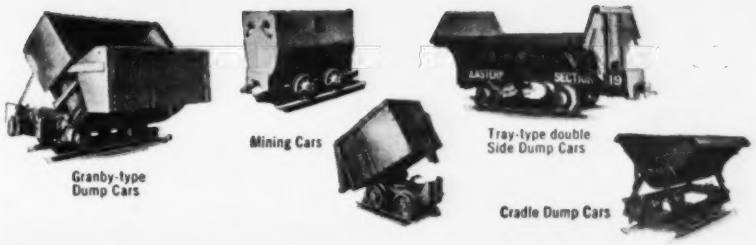
According to the author, the cost of World War II and the Cold War has run into ten to twelve hundred billions of paper dollars. The resultant destruction overshadowed anything that has thus far been seen in the history of 60 centuries of money.

As a result of the foregoing world-wide conditions, and others reported in this book, the author concludes, "Governments, more implicated in black market deals in 1952 than in the preceding year, will either (a) become honest again and return to stabilized freely convertible currencies, or (b) continue to tolerate and accept the 'diktat' of black markets." Mr. Pick predicts "It is the latter and easier solution which will prevail in the year to come (1953)." Published by Pick's World Currency Report, 75 West St., New York 6, N. Y. Pp. 197. Price $25.

Power Cranes, Shovels, Draglines. An outstanding booklet which will serve as an up-to-date handbook on power cranes, shovels, and draglines for open-pit operators, students, engineers and contractors. The first part of the booklet is neatly illustrated to show various attachments such as booms, digging tools, hooks, grabs, and buckets, and indicates where these attachments are used. The second part of the booklet tells how to set up a shovel, how to set up a crane, how to set up a hoe, and concludes with tables of weights of materials, and ditch and slope dimensions. Published by the Power Crane & Shovel Association, 74 Trinity Place, New York 6, N. Y. Pp. 60. Price $1.

Geology of the Keith-Muskego Townships Area. By V. K. Prest. Published by the Ontario Department of Mines, Toronto, Ontario, Canada. Pp. 44 plus maps.

Leitfaden der Erzaufbereitung. Published in German. By Dr. Gerth, Dr. Hamann, and Dr. Salzmann. A textbook on ore dressing covering conveying, crushing, grinding, screening, classification, and standard methods of concentration. Both theoretical and practical aspects of the subject are presented in addition to flowsheets and tables of performance. Published by Bonner Universitäts-Buchdruckerei, 30



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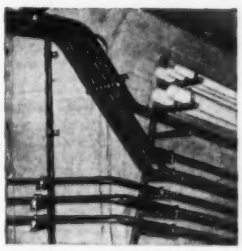

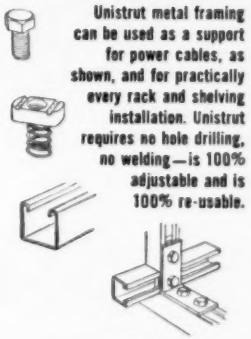
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Richard Wagner St., Bonn., Ger. Pp. 239. Price DM 43.80.

Practical Guides to Uranium Ore on the Colorado Plateau. By E. V. Reinhardt. This booklet tells where uranium ores are found, how to recognize various formations, describes the appearance of uranium ores, and concludes with an evaluation of various guides to ore. Published by the Atomic Energy Commission, Technical Information Service, Oak Ridge, Tenn. Pp. 13.

Facts and Figures About French North Africa. A beautifully illustrated, easy-to-read, capsule coverage of French North Africa. Following a historical resumé, this booklet presents facts about population, public health, education, standard of living, social and labor legislation, justice, agriculture, power, cities, ports, highways, hydraulics, mines, handicrafts, and economic and financial aspects of this area. Combined mineral output in metric tons of Algeria, Tunisia, and Morroco for 1951 is reported as follows: phosphates, 7,172,311; iron ores, 4,350,628; metallurgical grade manganese, 334,169; lead concentrates, 131,672; zinc concentrates and calamine, 65,789; cobalt concentrates, 6,255; soft lead, 41,311. Previous to the arrival of the French, mineral output in this area was nil. Published by the Office of Technical Publications of the French Prime Minister, 120 Rue du Chateau-des-Rentiers, Paris, France. Pp. 51.

Gold-Copper-Lead Deposits of the Yellowjacket District, Lemhi County, Idaho. By Alfred L. Anderson, University of Idaho. Published by the State of Idaho Bureau of Mines and Geology, Moscow, Idaho. Pp. 41 plus maps.

Index to Geophysical Abstracts 136-139, 1949; also, Index to Geophysical Abstracts 140-143, 1950. The abstracts which are indexed in these pamphlets are taken from world literature, periodicals, books, and patents. For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 1949 Index, 15¢; 1950 Index, 20¢.

Publications of the Geological Survey of Canada, 1917-1952. A list of publications compiled by Lorne B. Leafloor. Published by the Department of Mines and Technical Surveys, Geological Survey of Canada, Ottawa. Pp. 82. Price 50¢.

Publications of the California State Division of Mines, to October 1, 1952. Lists and indexes in this pamphlet cover maps, special publications, preliminary reports, registers of mines, reports of the State Mineralogist, California Journal of Mines and Geol-

ogy, bulletins, and special reports issued by the California State Department of Mines. Published by the California State Division of Mines, San Francisco 11, California Pp. 120.

Geophysical Abstracts 150, July-September 1952. Geological Survey Bulletin 991-C. For sale by Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Pp. 50. Price 25¢.

Saudi Arabia. Second Edition, by K. S. Twitchell. Mr. Twitchell's first edition published in 1947, has been brought up to date (through mid-1952) in this edition. As a personal friend of King Ibn-Saud and the Finance Minister, the author has been able to present a wealth of factual data on Saudi Arabia which is not available elsewhere. While the book is designed essentially to present facts, it is interestingly written, and generously illustrated with photographs covering all phases of Saudi Arabian life including the oil and mining enterprises. The only dividend-paying mine in the country is the Mahad Dahab mine which yielded 345,835 oz. of gold and 321,956 oz. of silver in the 1945 to 1951 period. Published by the Princeton University Press, Princeton, N. J. Pp. 231. Price $5.

Material Handling. A booklet laying down the general rules of material handling and demonstrating a basic method of analyzing and solving material handling problems. Published by the Material Handling Institute, Inc., 811 Clark Building, Pittsburgh 22, Pa. Pp. 12. Price 50¢.

Yachting Memories. By Clinton H. Crane. When the chairman of the board of a large mining company like St. Joseph Lead Co. takes time to write a book on yachting, you know that he's a real marine enthusiast—and that fact is brought out in the concluding chapter of this book in which Mr. Crane says of yachting: "I am convinced that it is our finest sport. The fellowship of the sea has brought me my dearest friends. I have enjoyed most to race against those who are keen to win but, win or lose, can treat racing as a game to be enjoyed in the playing and not as a war where winning is of paramount importance."

However, Mr. Crane's talent for the sea was not confined to racing, because he has been an accomplished professional architect specializing in yacht design—in fact one of the four architects who obtained the major share of yacht business in New York in the early 1900's. As a designer he was in an admirable position to become acquainted with many well-known and prominent people who were interested in yachts and racing. This background has enabled him to prepare a most interesting account of many famous races in yachting his-

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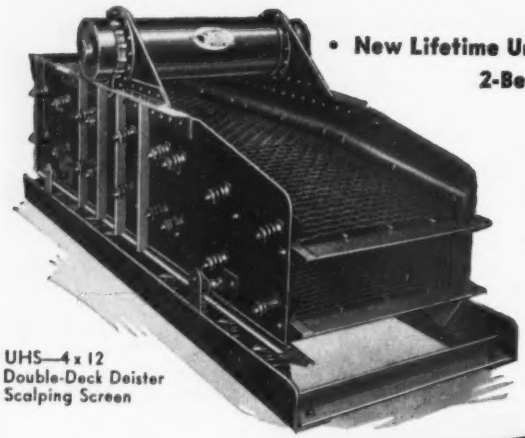

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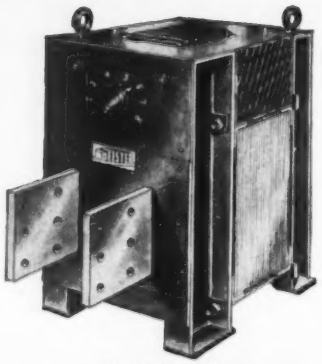

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Perhaps you might wonder how Mr. Crane changed his profession as yacht designer to mining engineer and eventually president of St. Joseph Lead Co. This is explained in one of the opening paragraphs of the book in which Mr. Crane relates his indecision as to what career to follow during his senior year in Harvard. Having decided to be an engineer of some sort, he was advised by Ira Hollis, dean of the Scientific School, to follow naval architecture and marine engineering. The Dean then added that the foundation of all branches of engineering were the same; if one were well grounded, a shift later to some other branch would be possible. "I learned how true this was," Mr. Crane concluded, "when I gave up naval architecture and became a mining engineer and, subsequently president of the St. Joseph Lead Co.

Published by D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 3, N. Y. Pp. 216. Price $6.

Kyanite and Sillimanite in Ontario. By D. F. Hewitt. A thorough and useful study of properties, occurrences, marketing, and production of kyanite and sillimanite. Industrial Mineral Circular No. 4, published by the Ontario Department of Mines, Toronto, Ontario, Canada. Pp. 10.

Torbay Map-Area, Newfoundland. By E. R. Rose. An interesting geologic study of the extreme eastern portion of the island of Newfoundland, including a description of the famous Wabana iron ore deposit. Published by the Canada Department of Mines and Technical Surveys, Geological Survey of Canada, Ottawa, Canada. Pp. 64 plus colored map. Price, 75¢.

Minerals—A Key to Soviet Power. By Demitri B. Shimkin. Considering the difficulty in obtaining reliable information on Soviet mineral production and potential, Dr. Shimken has done a remarkable job of recording and analyzing the Soviet mineral position. The text covers ferrous and nonferrous metals, gold, coal and lignite, petroleum and natural gas, and nonmetallics other than fuels. Production trends are carried from 1926 to 1950, with primary emphasis on Soviet estimates prepared between 1926 and 1938. The author carefully notes the relative reliability of his statistics throughout the book. Studies of Soviet potential for self sufficiency are estimated to 1970. Published by Harvard University Press, Cambridge, Mass. Pp. 452. Price $8.

Electronic Concentration of Ores With the Lapointe Picker Belt. By C. M. Lapointe and R. D. Wilmot, Radioactivity Division, Canada Department of Mines and Technical Surveys, Mines Branch, Ottawa, Can. Pp. 40. Price 50¢.

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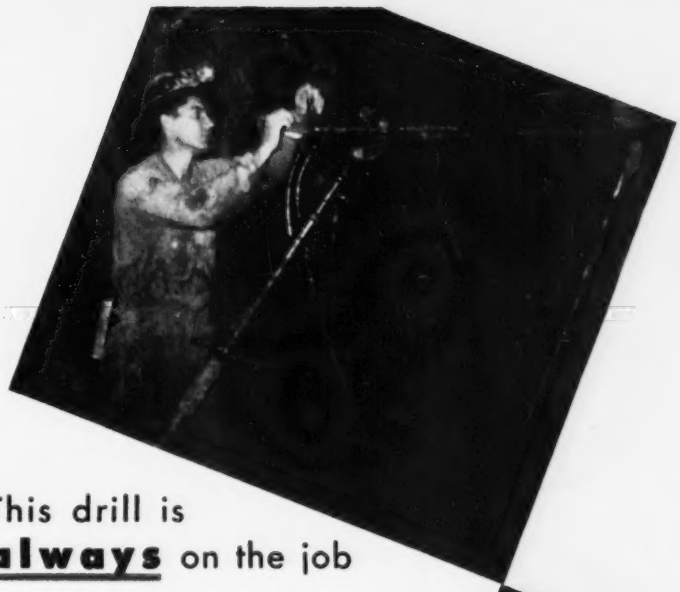

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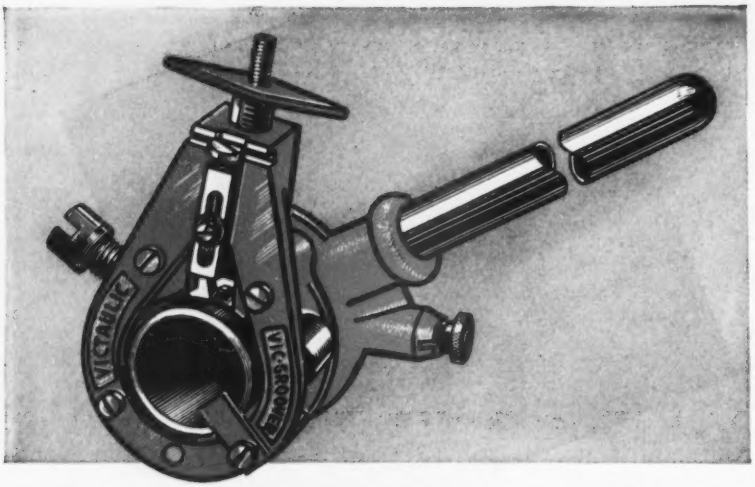

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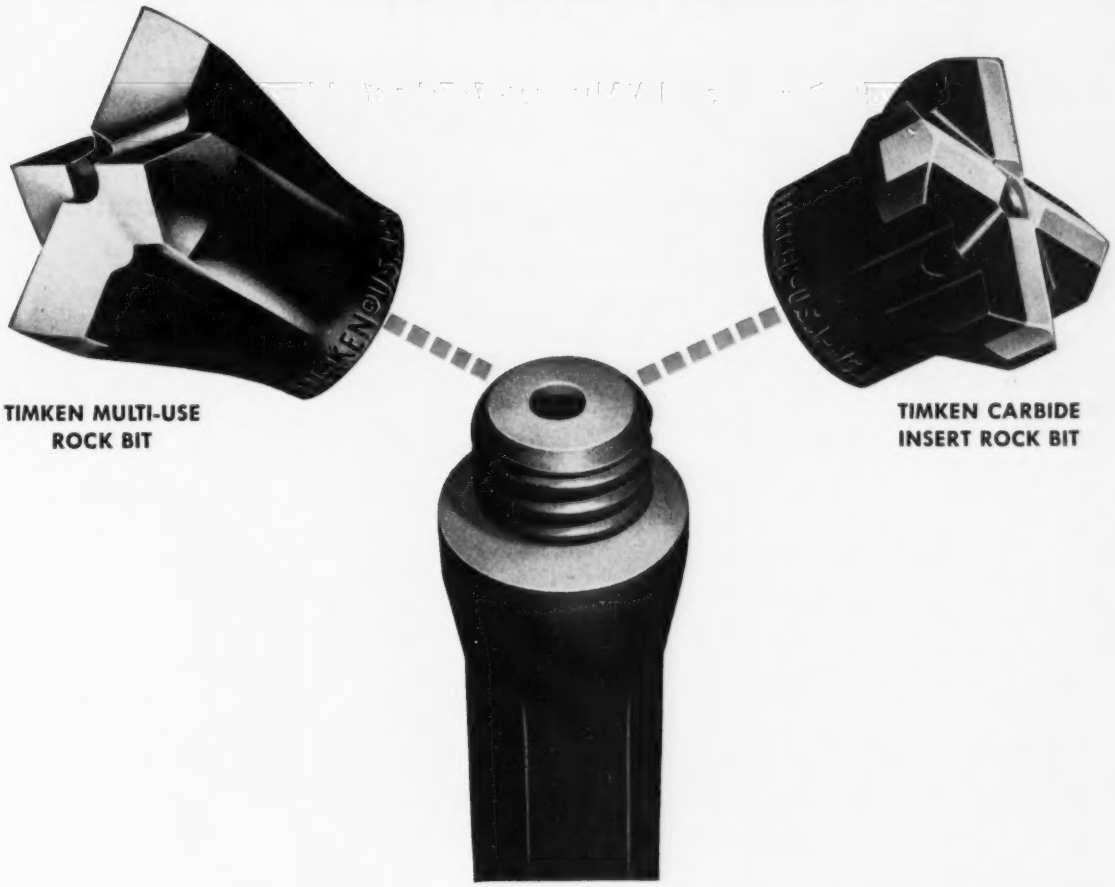

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With Timken interchangeable rock bits, drill steel inventory can be greatly reduced. And you can switch quickly to the most economical bit as the ground changes—right on the job!

With correct and controlled reconditioning, Timken multi-use bits give the lowest cost per foot of hole when full increments of steel can be drilled.

Timken carbide insert bits are the most economical for hard and abrasive ground. And they're best for maximum speed drilling, constant-gage holes, small diameter blast holes and very deep holes.

The combination of Timken multi-use and carbide insert bits will answer all your drilling needs. And every Timken bit has these three important advantages: 1) made from electric furnace Timken fine alloy steel, 2) threads are not subject to drilling impact because of the special shoulder union developed by the Timken Company, 3) quickly and easily changed.

Backed by 20 years' experience in solving rock bit problems, the Timken Rock Bit Engineering Service will help you select the best bits for your job. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

your best bet for the best bit
. . . for <u>every</u> job

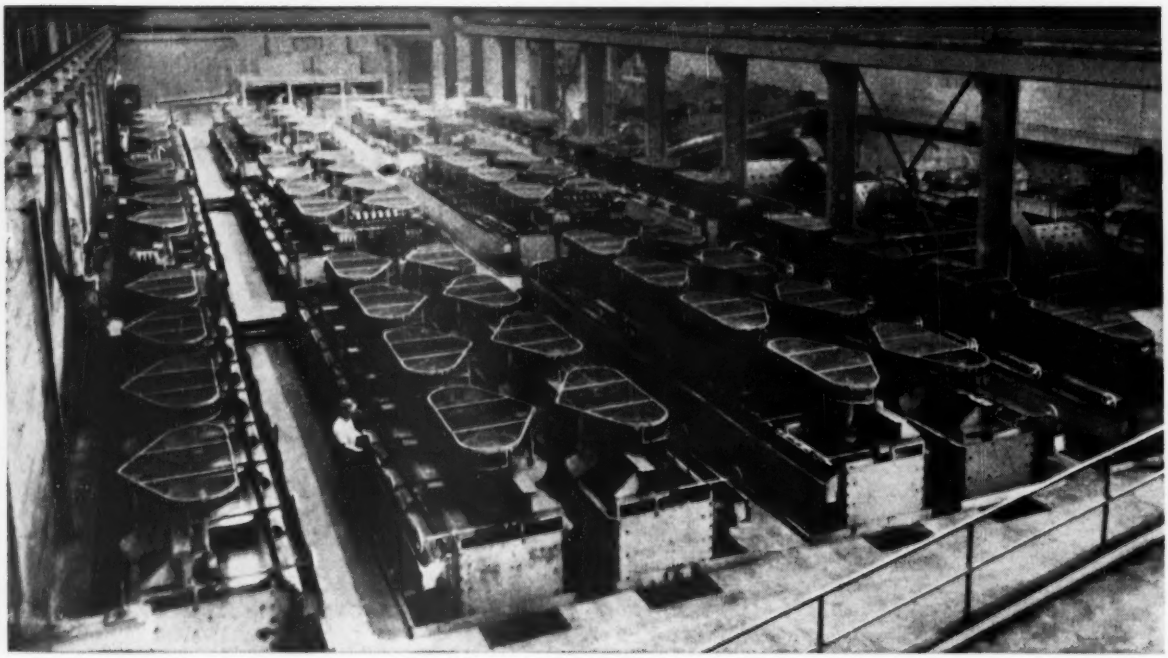
TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

DOW

CUT FLOTATION COSTS WITH DOW XANTHATES

Superior collectors increase profits by providing greater recovery, higher concentrate grade of sulfides



With Xanthates on the job every bubble is loaded to capacity, increasing your recovery and raising your concentrate grade. Because of their greater efficiency in fast, complete separation of the sulfide minerals, Dow Xanthates save you money.

For more efficient differential flotation, Dow offers a wide range of Xanthates of extremely selective collector power. Since all of these collectors are essentially nonfrothing, the operator enjoys complete freedom to regulate frother and collector independently.

Dow also produces Dowfroth* 250, a quality frothing agent giving improved metallurgy with lower frother consumption.

Learn more about these quality flotation agents, Dow Xanthates and Dowfroth 250. For further information and test samples, write to THE DOW CHEMICAL COMPANY, Midland, Michigan, *Dept. OC 3-41.*

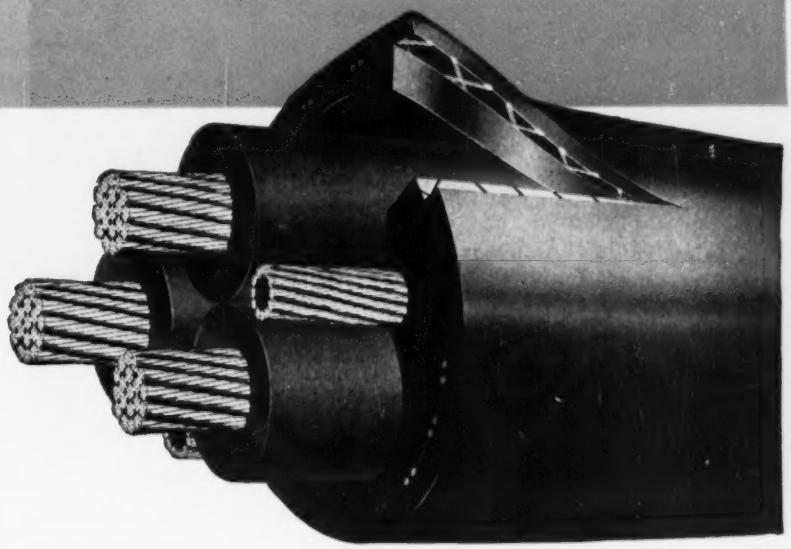
*TRADEMARK

you can depend on DOW CHEMICALS

DOW

Here's your mine cable insulated with COLD RUBBER

Another big improvement in Securityflex 600-V Mine Cable



Cold rubber is firmer and tougher and less permeable. It gives this new and better Type G Securityflex much more moisture resistance much more compression resistance much more cut resistance*

That means longer cable life, fewer power interruptions, less maintenance trouble, *much more value for your money.*

Also—the famous Anaconda patented rubber-cored grounding wires are non-kinking and cushioned in a larger diameter that won't cut insulation.

This means far more dependable and efficient grounding. When the cable twists in service the grounding wires are protected. Every wire in every strand is firmly supported and cushioned. There'll be fewer failures, fewer splices, less production loss, less expense.

Investigate this cable. See it. Call your nearest Anaconda Sales Office or Anaconda Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Trademark

the right cable for the job ANACONDA® WIRE AND CABLE

Use G-E GEOPRENE PORTABLE CABLE for the really tough jobs!

Built for the really tough jobs, G-E Geoprene portable cable is unsurpassed for use with shovels, draglines, loaders, and other heavy portable equipment.

Its abrasion-resistant neoprene-base jacket is resistant to most oils, acids, alkalies, sunlight, and flame. For additional strength, a tough, corded reinforcing mesh increases the cable's ability to withstand continual hauling and dragging, while the conductors themselves are rope-stranded for maximum flexibility.

In the full line of General Electric wires and cables you will find exactly the cable you need. This famous line includes G-E No. 1799 varnished-cambric-insulated cable, Super Coronol* cable, wire armored cable for borehole service, interlocked armor cable, aerial cable, mine telephone cable, Flamenol* control cable, and magnet wire.

**Registered Trade-mark General Electric Company*

You can put your confidence in—

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GENERAL ELECTRIC

WIRE AND CABLE IDEAS for Metal Mining

G-E Super Coronol preassembled aerial cable has many advantages over ordinary power cable. No field assembly is necessary . . . insulated conductors, binding strip, and messenger are completely assembled at the factory. Cable requires minimum clearance of right-of-way and can be quickly installed. Maintenance cost is low.

For the winding of motors, lifting-magnets, brake-coils, generators and starters, General Electric offers two types of magnet wire. For temperatures to 105 C, specify Formex*, Class A, an exceedingly flexible, tough, abrasion-resistant wire. Specify Deltabeston*, Class B, insulated with glass or asbestos, for temperatures to 125 C; Class H, with silicone-varnish impregnation, for temperatures to 180 C.

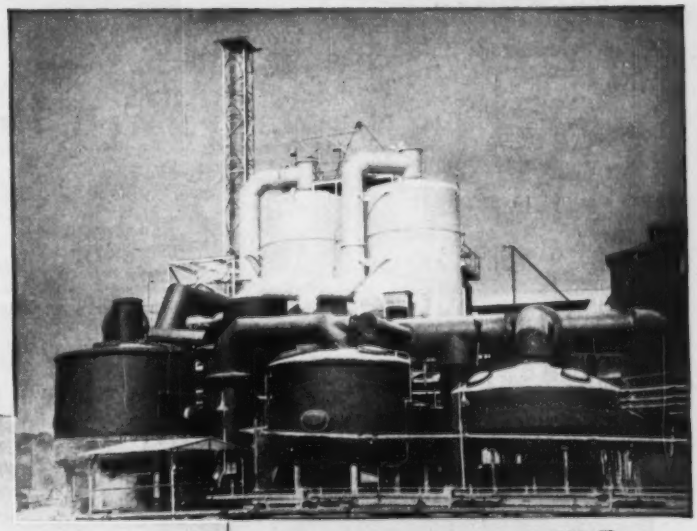
G-E shot firing cord is reliable and economical. Sturdy, flexible, highly resistant to moisture and mechanical injury, it has a *red* rubber jacket for easy identification.

The wide line of G-E wires and cables for the Mining Industry is described, with valuable application data, in this 24-page illustrated booklet. For your copy write to Section W71-495, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

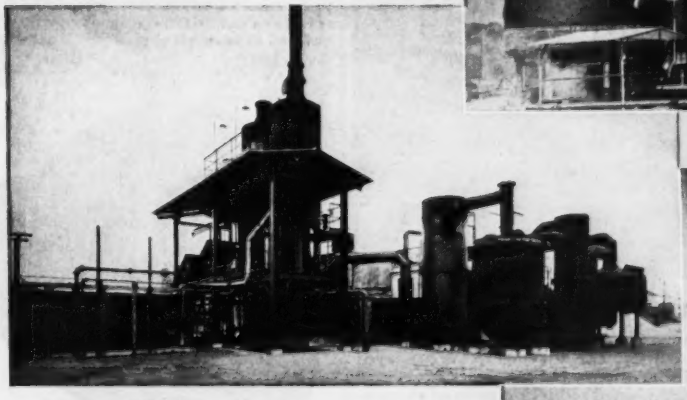
How much sulfuric acid do you need?

Among the many Chemico-built contact sulfuric acid plants in service today all over the world, one has a capacity of only five tons per day. Another produces more than five hundred tons per day. Others range in between.

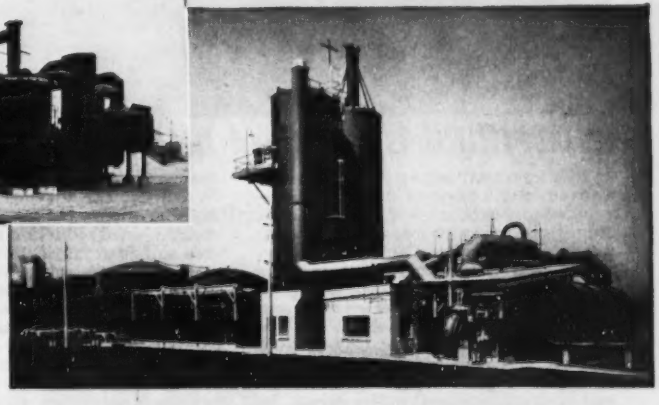
Whatever your sulfuric acid requirements are, Chemico will design and furnish you with a highly efficient plant exactly suited to your needs . . . on a one-contract, guaranteed-performance basis.



500 Tons



50 Tons



200 Tons

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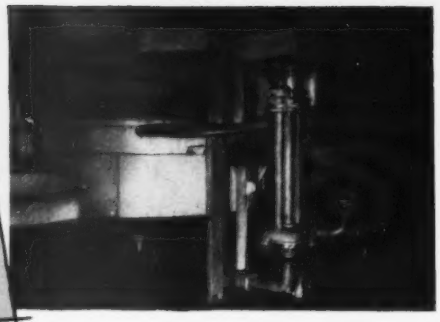
TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICAN CYANAMID (PTY) LTD., JOHANNESBURG

Chemico plants are profitable investments

This NEW Nagle "TV" PUMP is NO "WALLFLOWER"



IT'S prim and clean, and designed to mount on wall or side of a tank or sump, but it's no "wallflower." You'll find it in the thick of things! A single stage, bottom entrance, vertical shaft, dry pit pump for handling abrasive mixtures and corrosive liquids and slurries — pumps anything that will flow. The Nagle type "TV" gives you:

- Freedom from leakage — clean floors assured
- No stuffing box
- No submerged bearing
- Sizes from ¾" to 10"
- Capacities to 4,000 g.p.m.

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NAGLE PUMPS, INC.
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PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

Eliminate 70% to 90% of Conveyor Downtime

Cedarapids

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Built by IOWA

MOTORIZED HEAD PULLEYS

eliminate maintenance on chains, belts, sprockets, universal drives, countershafts, etc.

U. S. Pat. No. 3548399—Others Pending

EVERYTHING is contained INSIDE the pulley shell!

HERE'S a money-saving departure from conventional conveyor drives. A Cedarapids-Schrock *Motorized* Head Pulley is simply a new application of the long-proven gear reduction drive, with everything . . . electric motor, reduction gears and all moving parts . . . contained inside the drum, completely protected from grit, dirt and weather and with no outside parts or motors to service. 70% to 90% of conveyor trouble and downtime is saved by eliminating the exposed parts necessary with conventional pulley drives. In operation, the pulley shell rotates about the electric motor which is held stationary by a torque arm attached to the conveyor frame. The speed of the shell depends on the combined reduction ratio of the pinions and gears inside the shell. Compact, easy-to-install, job-proved Motorized Head Pulleys are available in sizes from 5 to 30 HP and in various widths.

Find out all the advantages of converting your belt conveyor or belt-bucket elevator installations to *motorized* efficiency before you need head pulley replacements. See your distributor today, or write for Bulletin MP-1.

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Built for sale in Arizona, California, Nevada, New Mexico, Southern Oregon, Southwestern Utah and Texas by
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NEW SUPER-TOUGH

WILLSON SAFETY HAT

THE NEW WILLSON SAFETY HAT is entirely new in design, material and method of manufacture . . . tough as metal and more resilient! Here are some other outstanding features of the new Willson Super-Tough* Safety Hat . . .

streamlined contour—deflects objects more effectively and provides a greater safety "pocket" inside.

new suspension design—adjustable "hammock" headband is suspended *inside* at 6 points. No exposed rivets or lacing—no holes through hat.

comfortably cool—space between headband and shell provides ample air circulation for wearer.

moisture resistant—practically 100% waterproof and resists many caustics and acids.

Passes all required tests with an extra margin of safety!

Write for your copy of the new bulletin describing the Willson Super-Tough* Safety Hat.

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More than 300 safety products carry this famous trademark

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Established 1870

WILLSON PRODUCTS, INC.
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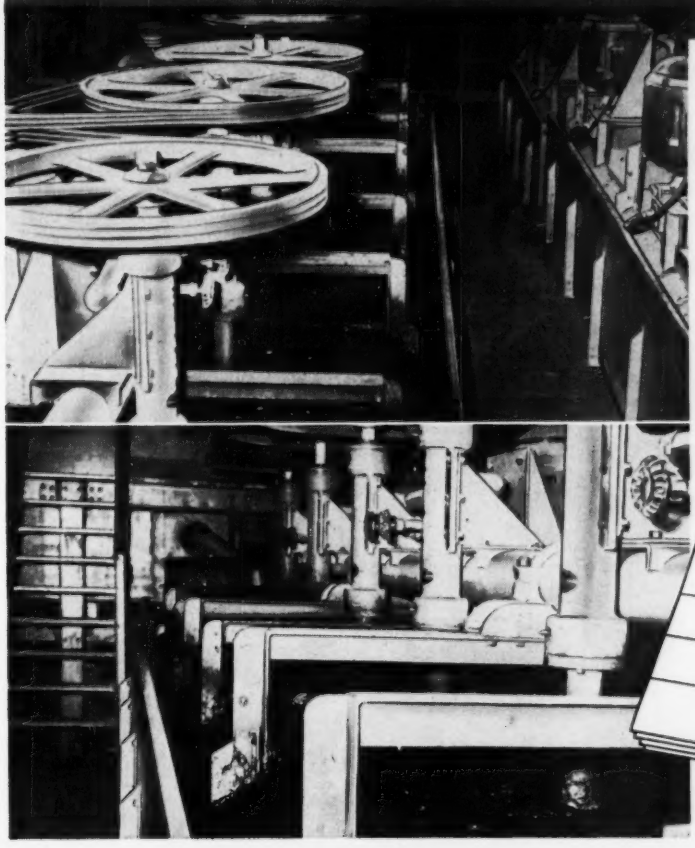
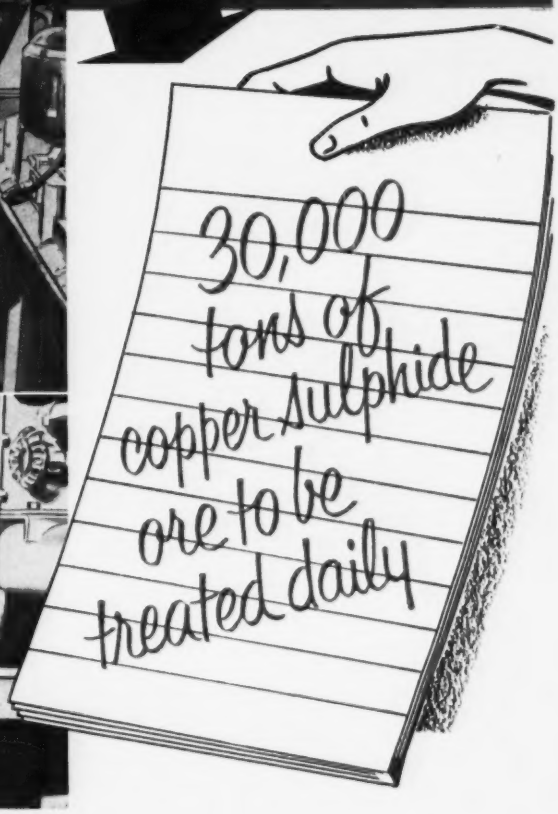
A Statistic like this is never dull...





Why AGITAIR got the assignment

This vast Chile Exploration Co. installation of Agitair Flotation Machines—580 No. 48 cells—is at Chuquicamata, Chile, location of the world's largest copper ore deposit. Agitair was chosen after tests in which the famed Machine led the field in economical use of power and reagent and compared favorably on all other counts. Agitair offers low power consumption, versatility of control, advanced metallurgy, low cost of operation and maintenance and of reagent consumption.

Agitair operates with a minimum of vibration. Froth overflow is easily controlled. There is less wear and tear on mechanism and rubber parts. Easy starting after shutdown and power failure is another feature millmen like.

Write for Bulletin 48 for full data on Agitair and Galigher ore testing service.

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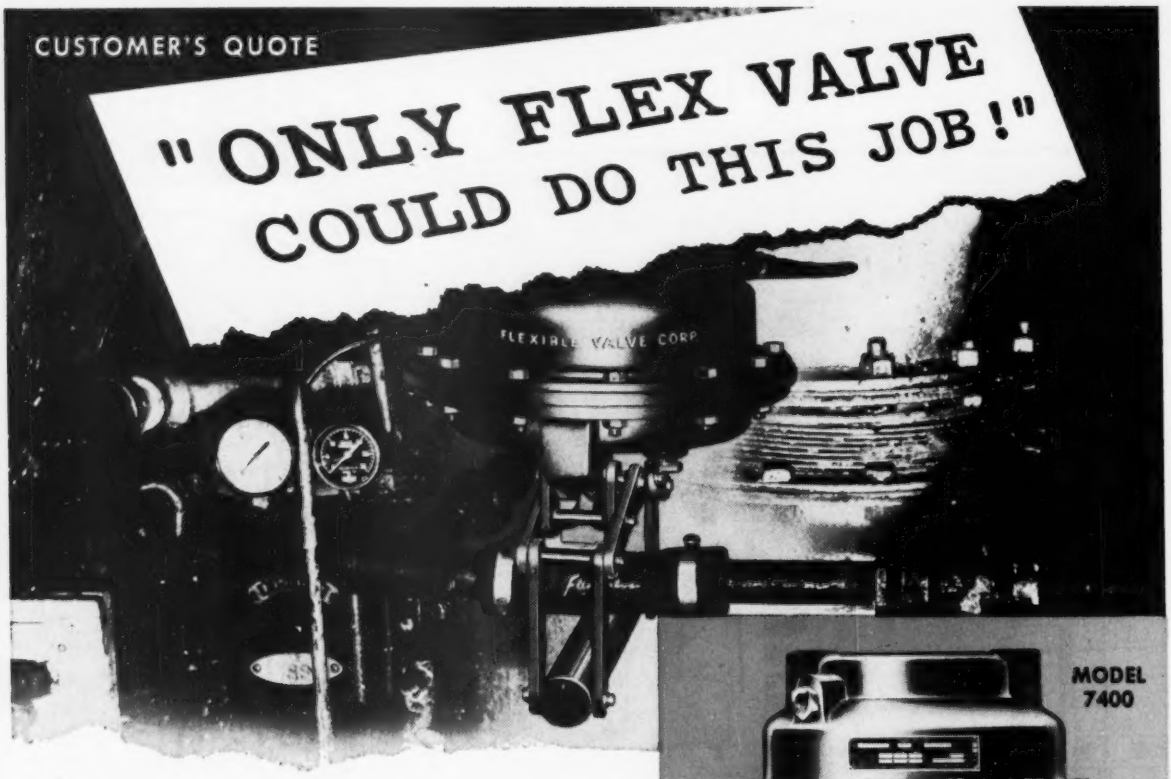
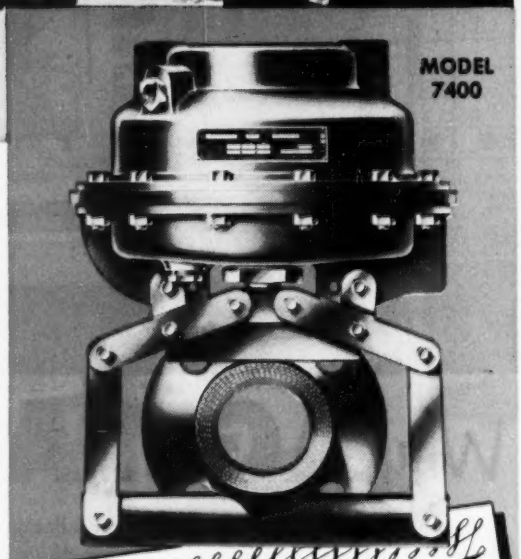
CUSTOMER'S QUOTE

"ONLY FLEX VALVE COULD DO THIS JOB!"





This diaphragm motor-operated Farris Flex Valve is handling a hard-to-convey, semi-solid slurry in a leading chemical processing plant. Before it was installed, other types of valves clogged after as little as a few hours' service. *Yet Flex Valve has performed perfectly for more than 3 years, in a 24-hour, 7-day-week operation.* Many other Flex Valve installations have been giving trouble-free, continuous service for 15 years or more. If you have a problem in controlling flow of any hard-to-handle fluid, send for Catalog No. FL 382

Exclusive FLEX VALVE Features (Pat'd & Pat. Pending)

- Will outwear any metal valve on abrasive service. Proven minimum 11 to 1 life over metal.
- Full pipe capacity.
- Will not freeze up in outdoor service.
- Excellent control characteristics in first ⅓ of travel.
- Complete closure for bubble-air tightness.
- Tight on grits up to ⅛".
- No obstructions, pockets, or internal parts.
- Valve body available in pure gum rubber, neoprene, butyl, buna-n, buna-s, food stock and special compounds.

We Guarantee
YOUR MONEY BACK
if Flex Valve plugs

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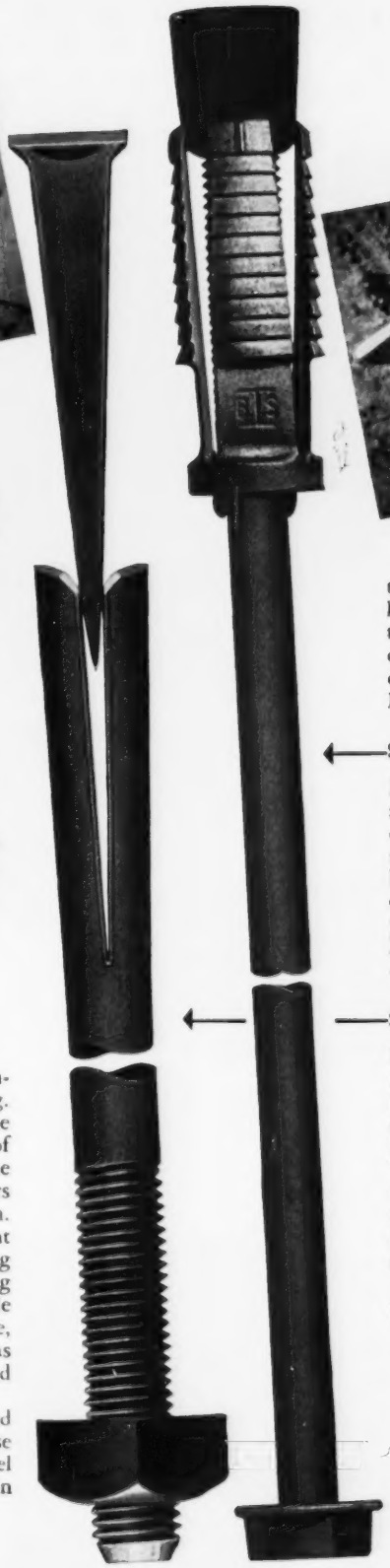
FOR GREATER SAFETY USE ROOF BOLTS



Where the safety of workers is concerned, it pays to use roof bolting. Roof bolts do much to eliminate the danger of accidents caused by roof falls because they virtually lock the roof in place by consolidating layers of strata into a thick, single-unit beam.

Roof bolting has other important advantages. It increases the operating efficiency of the mine by eliminating timber supports. It makes possible improved ventilation, faster haulage, wider mine openings, and larger areas in which to manipulate mechanized equipment.

All these conditions can be obtained by using Bethlehem Roof Bolts. These bolts are made from new-billet steel in lengths of from 2 ft to 8 ft, and in the two types illustrated. Each type has its place, depending largely on the type of roof encountered. The bolts can be used vertically or at angles. For complete information, write to us at Bethlehem, Pa.

SQUARE HEAD ROOF BOLT

For 1⅛-in. hole. Comes with expansion shell. Rolled-thread bolt has unchamfered head. Pressed ears on shank support shell during anchoring. When bolt is tightened, plug expands leaves of expansion shell to provide holding pressure. Leaves lock against sides of hole to prevent shell from turning during installation.

SLOTTED ROOF BOLT

For 1¼-in. hole. Forged slot accommodates steel wedge. Slot is automatically centered, forms equivalent of two half-rounds. Opposite end of bolt has 5 in. of 1-in. rolled threads. When driven into hole, wedge penetrates slot, expanding bolt-ends. Has truncated-cone point to prevent thread damage. Fitted with American Standard Regular Square Nut.

BETHLEHEM STEEL COMPANY

BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

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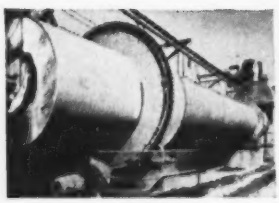
BETHLEHEM MINE ROOF BOLTS

cut down on
drying expenses...with a
LOUISVILLE DRYER
by
General American



Louisville Rotary Cooler with rotary shell and external water sprays.

Louisville Rotary Steam-Tube Dryer —indirect type using steam as heating medium, and utilizing 85% of that steam for useful work.

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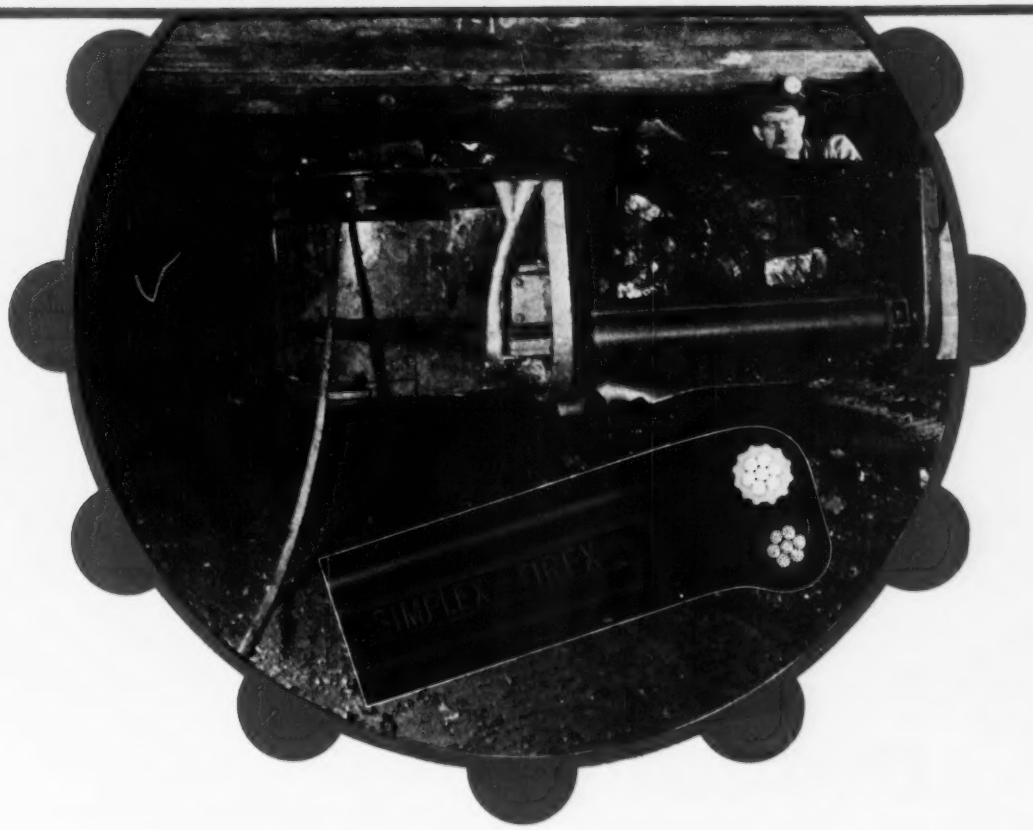
More than once, a Louisville Dryer has turned a losing operation into a profitable one. Write or call for a Louisville engineer to make an obligation-free survey of your operation.

GEARED for ACTION



Simplex-TIREX Shuttle Car Cables are "geared" for your protection. They assure you of top quality performance under the severe strains of modern mechanized mining. Only TIREX has insulated conductors that are "geared" to firmly interlock with the jacket.

TIREX Shuttle Car Cables are "geared" for action against the continual yanking and pulling of the cables as they are reeled and unreeled, while the shuttle car moves back and forth about the mine. For added protection all TIREX Shuttle Car Cables are **cured in lead.** They resist snagging, abrasion, oils and flame.

Why not specify and get TIREX Shuttle Car Cables. They always mean safety, economy and efficiency. For information on this or other members of the Simplex-TIREX family, write in care of the address below.

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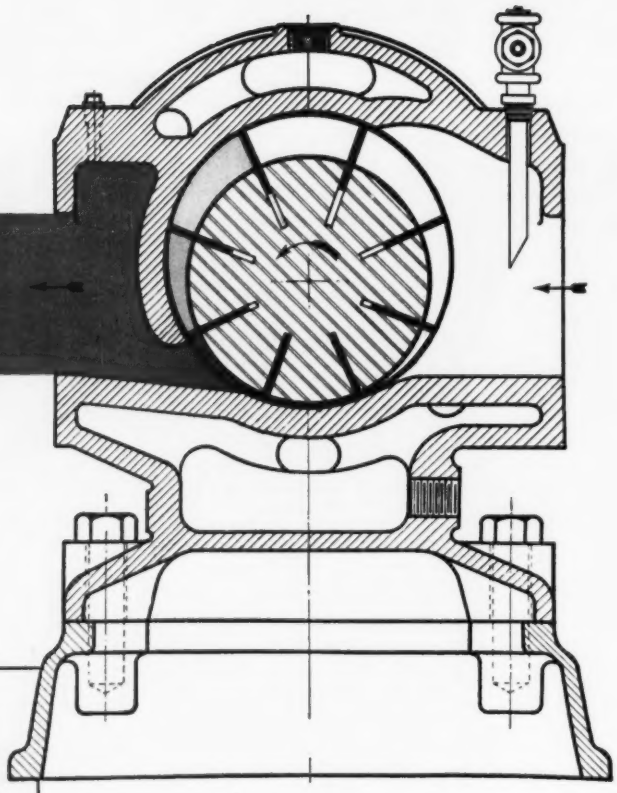
putting the

on compression costs



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When you consider all the many uses you have for compressors—consider the best way to get compression with dependability, and minimum cost and attention.

Fuller Rotary Compressors have so many inherent advantages that they warrant your closest examination. Free from reciprocating parts, with no valves to leak or seats to grind, no unbalanced forces to set up vibration. Fuller Rotary Compressors assure low-cost, smooth-flow operation during their long life.

Check your own compressed-air needs and send this check list to Fuller. A Fuller engineer will give you the *right* recommendation to save you money. Write now to Fuller Company, Catasauqua, Penna.

Fuller **Pioneers of high-efficiency vane-type rotary compressors**

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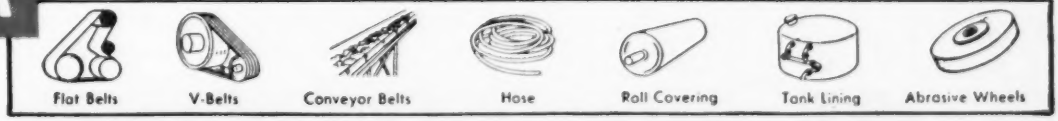
MORE SHOCK-LOAD CUSHIONING . . . The extra body-cushion built into Homocord Conveyor Belt dissipates even the shock of sharp impact from large lumps of coal, rock and ore . . . A Homocord Conveyor Belt resists gouging and cutting. It lasts longer . . . and hauls more too—because it troughs naturally and trains easily in the idlers. That's MORE USE PER DOLLAR. Another R/M Conveyor Belt, Ray-Man "F", is designed particularly for underground mining where pulleys are small and great flexibility and tear resistance are needed. Both of these R/M belts give you long life on the job, MORE USE PER DOLLAR. Ask the R/M distributor for Bulletins 6906 and 6915. R/M field engineers back him up to save you money—not only in conveyor belts, but in hose, transmission and V-belts.

R/M

MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



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CUT YOUR GRINDING COSTS WITH AFCO FORGED STEEL BALLS

Choice of Chrome-Moly or Carbon Steel ¾" to 5"

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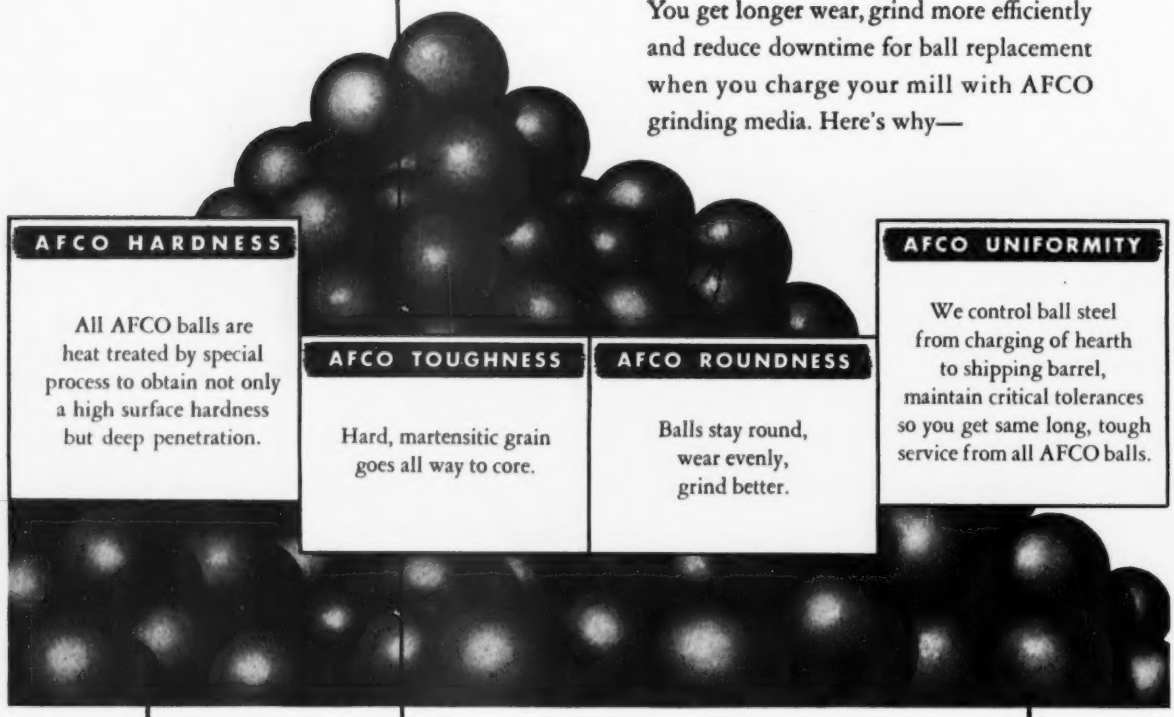

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Hard, martensitic grain goes all way to core.

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Balls stay round, wear evenly, grind better.

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We control ball steel from charging of hearth to shipping barrel, maintain critical tolerances so you get same long, tough service from all AFCO balls.

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charge your mill with AFCO balls, compare them with any other ball you've ever used. Write, wire or phone NOW for prices.

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"BLUE RIBBON" PRODUCT
This is the Coppus VANO. The propeller-type, best for shorter pipe lines, medium pressures.
This is the Coppus VENTAIR. A centrifugal blower, it is designed for long pipe lines, high pressures.

These are the cost-reducing Blowers that give up to 100% more air

Only Coppus makes both types — and both are made especially for *mine* ventilation. One or the other, operating under the conditions for which it is designed, delivers from 30% to 100% more air for a given power consumption than an ordinary all-purpose fan.

They can be used as blowers or exhausters and are driven either by compressed air or electric motor, with capacities up to 90,000 CFM. Like all Coppus products, these blowers wear the "Blue Ribbon" that stands for high achievement in engineering, workmanship and performance.

› *Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corp., Worcester 2, Mass.*

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Why dust recovery is a profitable investment

Nineteen years ago, our engineers developed what we think is the most workable way of solving the Dust Recovery problem. It was the formation of "dust recovery teams", consisting of Buell engineers and the plant engineer—the man who knows his particular dust problem better than anyone else.

This team, drawing on the experience and background of Buell, coupled with the plant engineer's intimate knowledge of his own problem, brings about the kind of results industry has been seeking: substantial profit increase, greater plant yield, improved product and/or process, better employee morale.

To learn more about Buell's **3 basic systems** of Dust Collection, Buell's Team-Up with the Plant Engineer, and how they can work for you—send for the new informative booklet entitled, *The Collection and Recovery of Industrial Dusts*. Buell Engineering Co., Dept. 19-D, 70 Pine Street, New York 5, N. Y.

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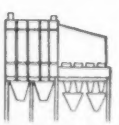
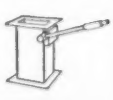
VAN TONGEREN CYCLONE

'SF' ELECTRIC PRECIPITATOR

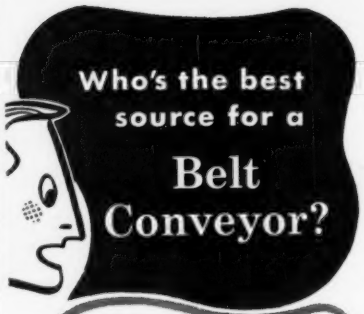


PRECIPITATOR-CYCLONE COMBINATION

TYPE 'LR' COLLECTOR



DUST HOPPER VALVES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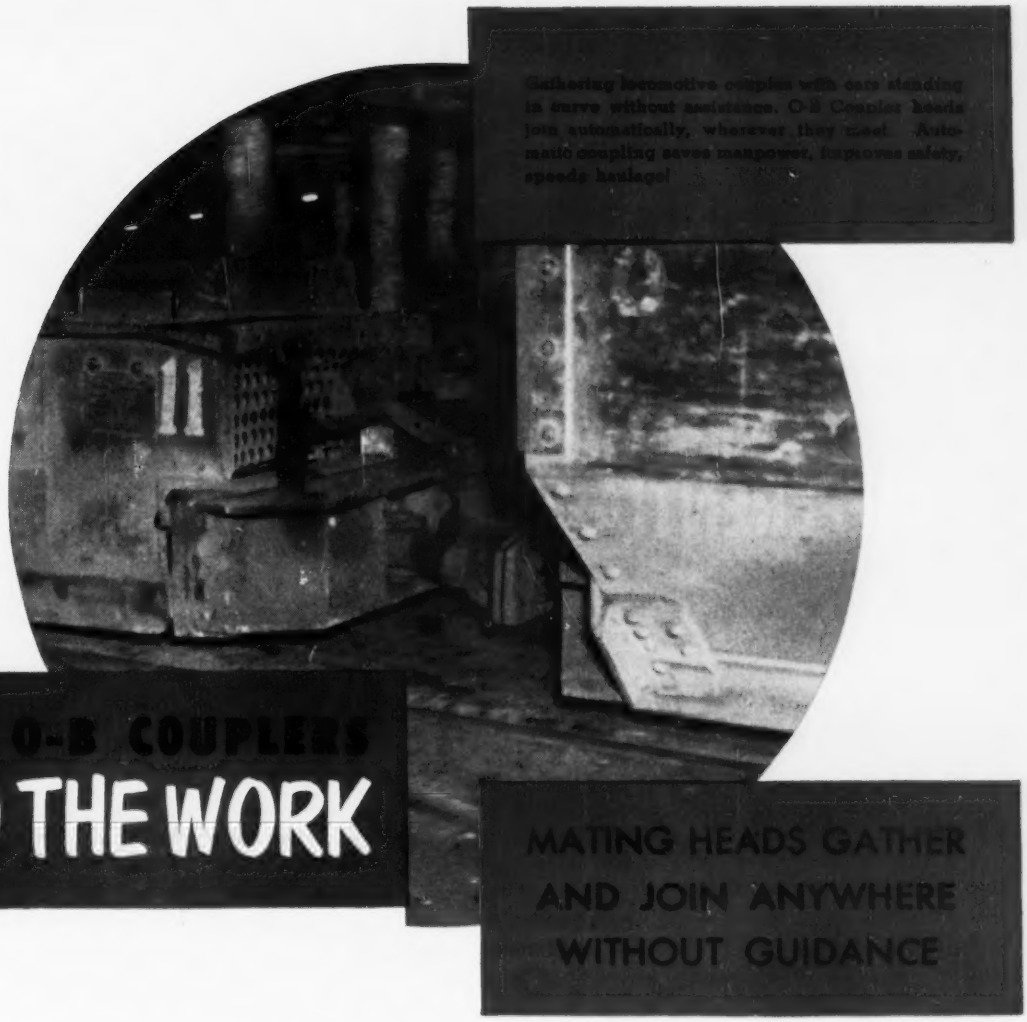
Gathering locomotive couplers with cars standing in curve without assistance. O-B Coupler heads join automatically, wherever they meet. Automatic coupling saves manpower, improves safety, speeds haulage!

LET O-B COUPLERS DO THE WORK

MATING HEADS GATHER AND JOIN ANYWHERE WITHOUT GUIDANCE

"Join Anywhere" ability in O-B Automatic Mine Car Couplers gives any haulage operation increased safety and speed. Cars equipped with O-B couplers join and automatically couple under any normal haulage condition. Extra-wide gathering range of these couplers permits mating heads to guide one another together wherever cars meet - in curves, dips, or knuckles.

Horizontal gathering range for O-B couplers is 15 inches, or 7½ inches to either side of the coupler centerline. In dips or knuckles, cars may be displaced as much as 14 degrees (and this can be increased to 22 degrees). Even at these extremes O-B couplers meet and join readily.

Increased safety results from O-B coupling, for there's no need for a man to enter the between-cars danger zone. Speed comes with O-B coupling, too. Cars join when they meet, saving the time it would otherwise take to make a coupling by hand.

Couplers with "Join Anywhere" ability keep workmen out of a danger spot; speed haulage movement. Those are pretty good reasons for choosing O-B for your new or remodeled cars!

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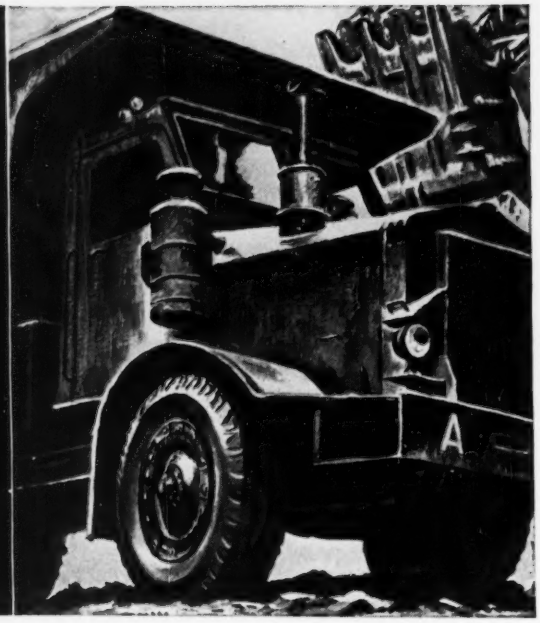
You Can Extend Life of ENGINES, TRANSMISSIONS and DIFFERENTIALS



With Allison Torqmatic Drives

BASED on user records, heavy-duty trucks equipped with Allison TORQMATIC CONVERTERS and TRANSMISSIONS *last longer and cost less to operate* than trucks with mechanical drives.

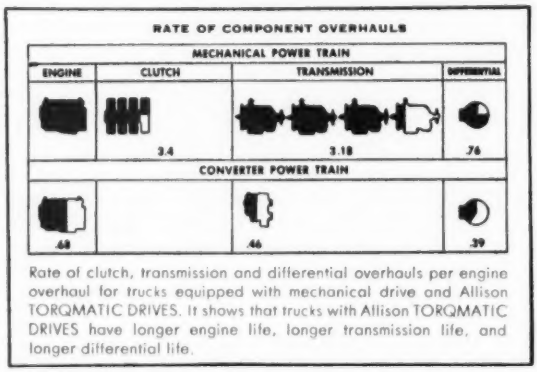
Records show that Allison TORQMATIC DRIVES boost truck availability, enabling operators to improve their schedules and, thus, they can do more business.

Trucks — and other heavy equipment — with Allison TORQMATIC DRIVES use the flexibility of the converter to start heavy loads and make shock-free gear-shifts at full power. The Allison TORQMATIC DRIVES automatically balance engine power with the load requirement. Its automatic operation makes the driver's job easier and reduces wear on the whole unit—thus cutting maintenance cost.

You are interested! Attach this advertisement to your letterhead and send it to Allison. You will receive detailed evidence on what these Allison TORQMATIC DRIVES will do for you.

And the next time you're ordering heavy-duty equipment, you'll ask your dealer or manufacturer for units with Allison TORQMATIC DRIVES.

ALLISON *Division of* GENERAL MOTORS
Box 894 MM, Indianapolis 6, Indiana



Rate of clutch, transmission and differential overhauls per engine overhaul for trucks equipped with mechanical drive and Allison TORQMATIC DRIVES. It shows that trucks with Allison TORQMATIC DRIVES have longer engine life, longer transmission life, and longer differential life.

MATCHED UNITS BUILT BY ONE MANUFACTURER

Allison TORQMATIC DRIVES

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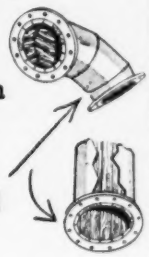

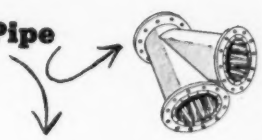

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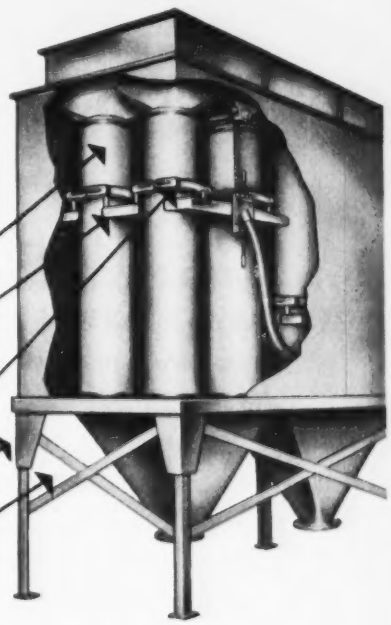
AEROTURN is proud to announce its NEW series 12 Dust Collector, the result of eight years of intensive research and successful application in more than 40 industries. Produced under Hersey Patent Rights and pioneered by the Turner and Haws Engineering Co., Inc. of Boston, AEROTURN is industry's most advanced, automatic, self-cleaning dust collector. A high volume air cleaning rate at a substantial, dollar-saving economy is produced by AEROTURN'S fully automatic, pressure regulated, reverse-air-jet cleaning operation.



NEW Series 12 features include:

★ Standard 12" diameter felt filter bags.

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★ Improved automatic, self-adjusting blow rings.

★ Overall reduction in size of collector unit.

★ Standardized overall design featuring pre-assembled units for reduced installation time and costs.

Whatever your dust collection problem, including reclamation of filtered material, you'll find that an AEROTURN Dust Collector will meet your needs successfully and economically. To learn more about the NEW Series 12 Collector, simply fill in the coupon below and mail, or a T & H Representative will call at your request.

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Republic WIRETEX Hose has all the desirable characteristics of flexible, high-quality rubber hose. It bends naturally to fit any connection. It's not weakened by vibration or flexing. It resists a wide span of temperature variance between—40° F. and +200°F. It's oil, grease and abrasion-resistant and won't rust or corrode.

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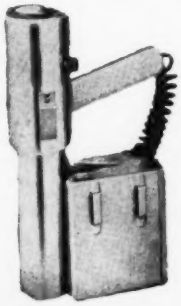
FIND URANIUM 100 TIMES EASIER



Model 111 (pictured above) . . $495.00
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DINGS POCKET-SIZED MAGNETIC EXTRACTOR SAVES TIME, MONEY AND LABOR . . .

JUST attach the Dings Drill Extractor to an old jackbit, insert in hole and pull out detached bit or broken rod . . . in minutes a tough job is done and a hole is saved.

Try one—just $10.00 for the 1¼" diameter Extractor, $12.00 for the 1⅝", $20.00 for the 2⅛". Money back in 30 days if you're not satisfied. Send order to Dings Magnetic Separator Co., 4716 W. Electric Ave., Milwaukee 46, Wis.

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The pre-tested toughness of Atlas Roller Chain lets it take a beating, stand up longer. That means lower maintenance and fewer replacements, greater production and higher profits.

For full rated speeds on all your machines, under any operating condition, install Atlas "Super-Life" Roller Chain—the chain with the extra stamina. Write today for the new Catalog and Handbook on Atlas Chain.

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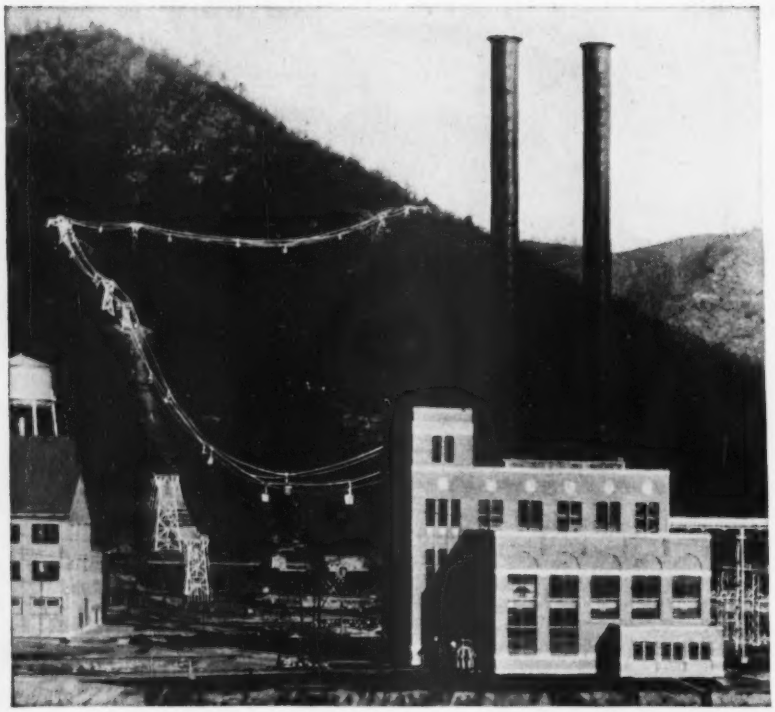
ATLAS ROLLER CHAIN

Aerial tramways give low-cost transportation

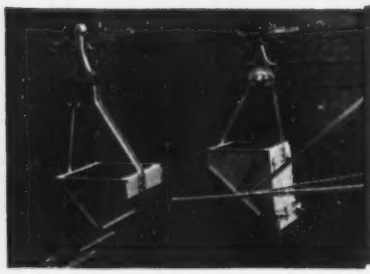


This 8,775 foot bicable tramway has been in continual operation for 23 years, transporting large quantities of coal at low ton-mile cost and giving dependable all-weather service.

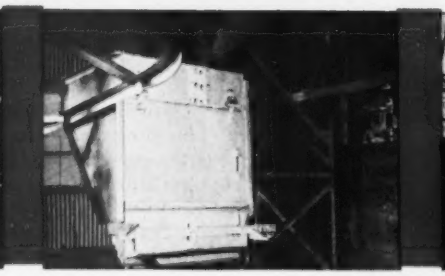
The tramway has two stationary track cables and a traction rope that moves continuously in one direction. Buckets clamp to the moving rope at 205 foot intervals and move at 500 feet per minute.

The 48 cu. ft. end dump buckets load and unload automatically. For loading, buckets detach from traction rope, run on graded rails, and attach again after being loaded. Detaching and attaching are also automatic.

This aerial tramway was designed and installed by the Tramway Division of U. S. Steel at the Alloy, West Virginia, plant of Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation.



Conveying materials for a few hundred feet or for several miles, Columbia-Geneva Tramways can be built to handle from 1½ to more than 300 tons hourly. They can be designed to meet almost every type of operating condition, and to handle many kinds of commodities easily and economically—from a tray of optical lenses to a carload of lumber.



Load carriers, like this one on a bicable tramway, are available in many different types and sizes. Services of Columbia-Geneva's Tramway Division include designing the tramway...supplying the steel...excavating for foundations and erecting support structures...furnishing and installing all wire rope, cables, and electrical and mechanical parts.

Tramway support structures are of many types, depending on terrain and job. Because of this flexibility, tramways are free of ground contour, roads, railroads, etc., are unhampered by bad weather, and can climb extremely steep grades. Other advantages: loads can be moved without rehandling and rights-of-way are easier to acquire.

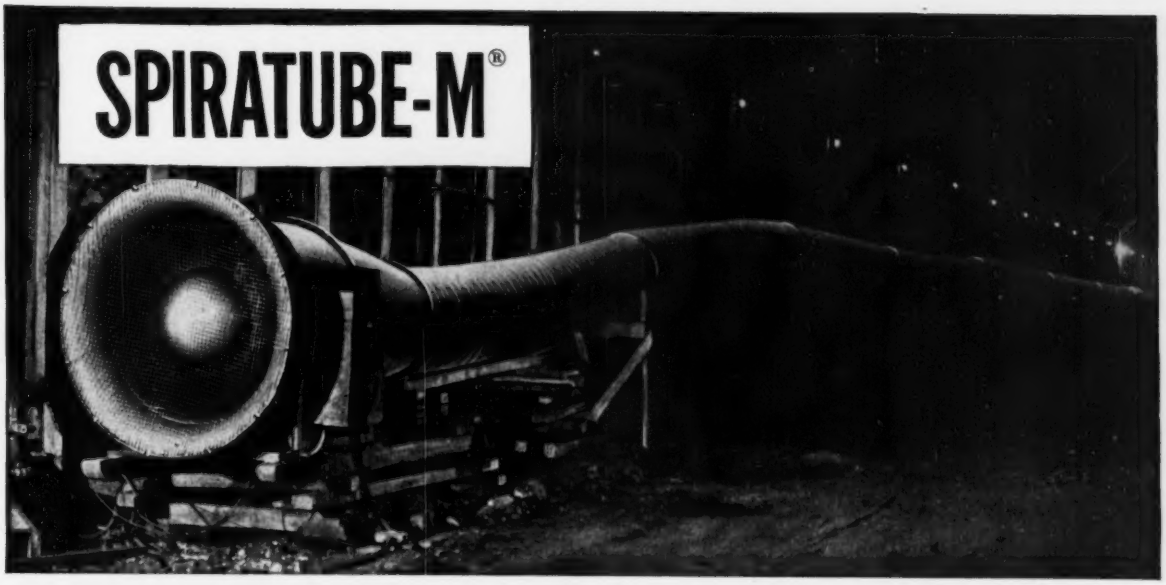
Send for this free manual on aerial tramways. Write on your letterhead today to the Tramway Division, Columbia-Geneva Steel, 141 Battery St., San Francisco 6, Calif. Or for an expert study of your transportation needs, ask for the services of a Tramway Engineer. He can show how an aerial tramway would pay off for you, and he can contract for its design and all phases of its construction, including materials.

Tramway Division

Columbia-Geneva Steel

Division United States Steel Corporation

UNITED STATES STEEL



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Here's the airduct that can take it! Now you can deliver air to the working face of mine or tunnel – cheaper! That's because SPIRATUBE-M is built to cut maintenance costs! Ease of handling reduces installation costs. Unique SPIRATUBE-M construction features minimize leaks and seepage. And you get the maximum efficiency of your blower or fan . . . cutting power costs!

Immediately available in diameters to 30 inches, from fully-stocked distributors, SPIRATUBE-M is made in tough high count fabrics, all specially treated and heavily coated inside and out to withstand fungus, mildew and rough treatment.

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Hazasheath starts with a corrosion-resistant Hazaloy-coated conductor, then the insulation—Watertite—a rich rubber compound with the ability to retain its superior electrical and mechanical properties after years of continuous immersion in water. Next, in the case of multi-conductor cables, the protective tape and moisture resistant fillers. Finally, the Hazaprene Sheath—extra thick to withstand, chemically and physically, the rigors of underground service. For high voltage applications, this sheath is pressure-vulcanized in continuous metal molds for maximum toughness and resiliency.

HOW DOES IT STAND UP?

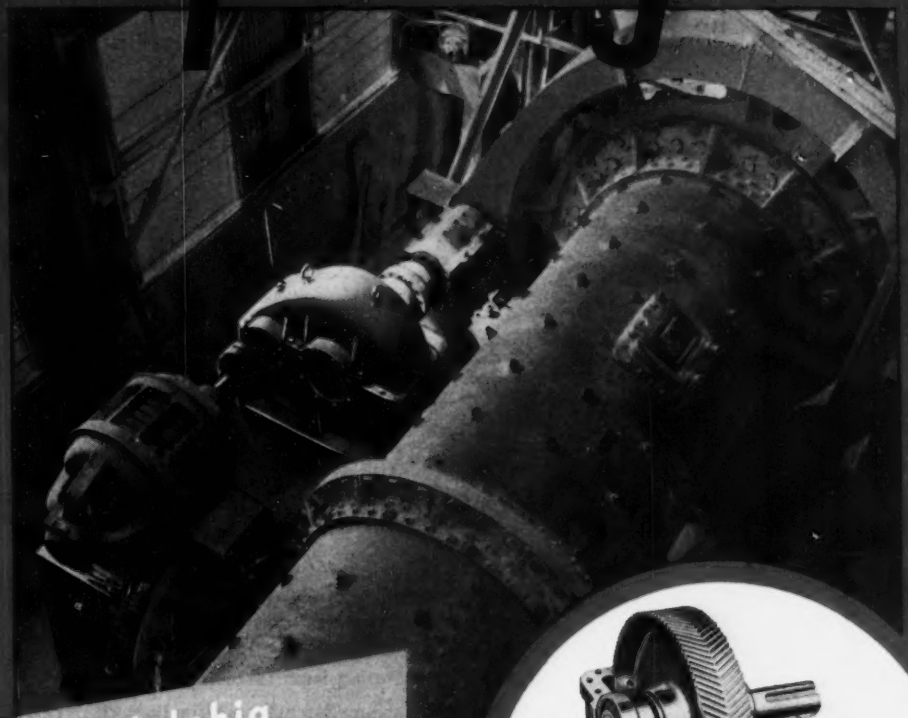
Since the development of Hazasheath Underground Cable, millions of feet have gone into service in airports, street lighting systems, mine power circuits—the most demanding types of installations. In addition, Hazard Watertite Insulation, introduced over 25 years ago, has been used in every type of construction work where dampness demands maximum moisture resistance.

WILL IT SAVE ME MONEY?

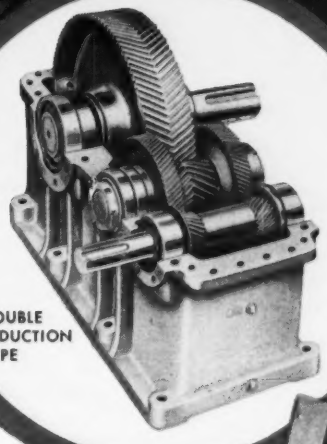
If you're looking for an underground cable that will last for years, that's easy to install and splice, and requires the least amount of maintenance—specify Hazasheath Underground Cable. Long life and dependable performance mean long-term economy...over the years you'll agree that the wise buy's Hazasheath. Let your Hazard representative show you. Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pa.

HAZARD

BUILT FOR... TOUGH JOBS



Philadelphia HERRINGBONE Speed Reducers



DOUBLE REDUCTION TYPE

The 150 horsepower unit shown above driving a ball mill in a building plaster manufacturing plant demonstrates the rugged construction and built-in stamina found in all Philadelphia herringbone reducers. They've proven reliable in every-day, on-the-job service. With single, double and triple reduction types available in standard ratios ranging from 1.75 to 1 up to 292 to 1 practically any requirement can be met. Efficiencies up to 98% are given.

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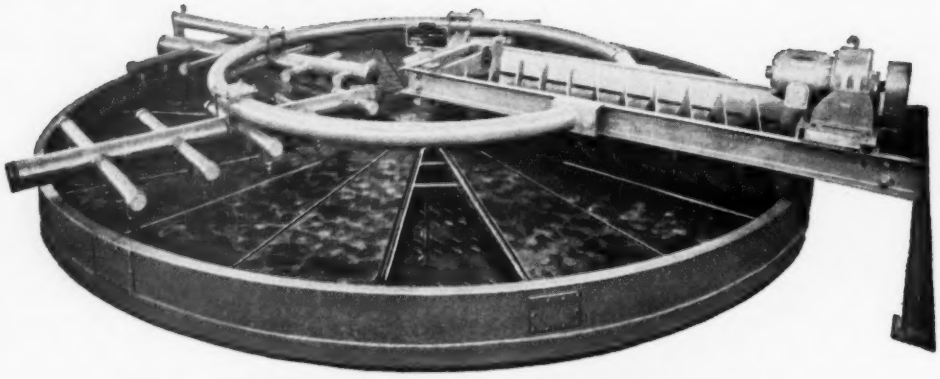
Industrial Gears and Speed Reducers
LimiTorque Valve Controls

OLIVER



Horizontal Filter*

All Flow is Downward Aided by Gravity

AND every operation on the Horizontal Filter that needs to be seen can be seen:

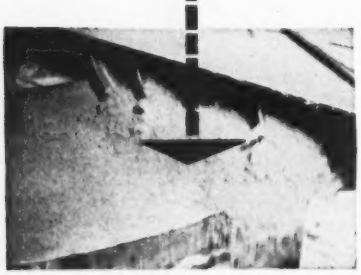
- feed
- cake formation
- rate and effectiveness of dewatering
- direction and distribution of wash
- cake discharge

Nothing of operating importance is hidden.

The Horizontal Filter handles pulps with certain crystalline or fibrous solids or where they tend to settle rapidly. While this filter and the Dorrco somewhat complement one another, the Horizontal offers certain special advantages. It provides exceptionally high capacity and excellent washing. It can handle big tonnages.

If you have a product in the classification outlined above, that requires dewatering or washing, tell us about it in detail. We'll be glad to recommend the best filter to bring about the results you want.

The important fact to keep in mind is that, including the Horizontal and Dorrco, we have four distinctly different continuous vacuum filters for handling mineral products as well as several pressure type filters from which to select. And, further, in making our recommendations we call upon 45 years filtration experience in the metallic and non-metallic mining industries.



Oliver Horizontal Filter
Scroll Discharging Cake

*U.S. Patent Nos.
2,588,912
2,588,976

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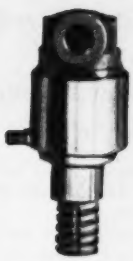
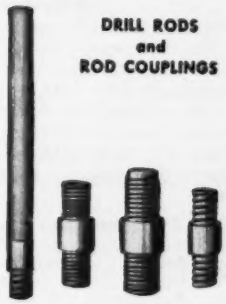


WATER SWIVELS



DRILL RODS and ROD COUPLINGS

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TRIED AND PROVEN FEATURES, developed through extensive field experience, are continually being incorporated into all Longyear drilling supplies. Whatever your requirements—core barrels or water swivels, drill rods or safety clamps—you can depend on getting the best when you specify . . .

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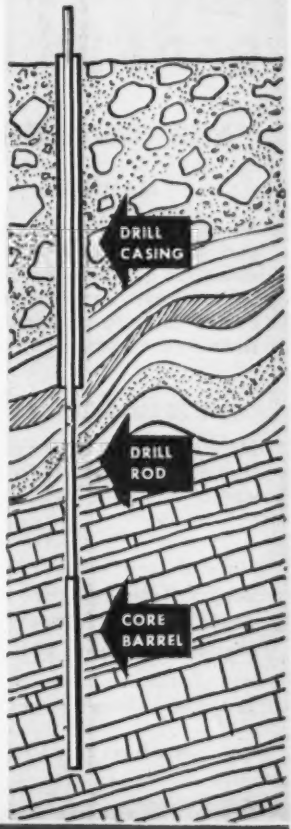
- Drill Hole Surveying Instruments
- Drill Rods
- Fishing Tools
- Hoisting Plugs
- Pressure Packers
- Safety Clamps
- Sampling Equipment
- Water Swivels

YOU CAN DEPEND, TOO, on getting the best of diamond bits promptly from Longyear's complete stock of standard core bits, casing bits and shoes and reaming shells. Selected stones, carefully set for maximum efficiency assure you of bits that will cut faster and last longer. Thereby you reduce your over-all costs. Special diamond bits can be obtained on order.

• Longyear engineers, qualified by years of experience, will help you select the tools best suited to your operation. For prompt attention to your requirements write to us TODAY.



In U.S.A.
E. J. LONGYEAR COMPANY
Minneapolis 2, Minn.

Longyear

In Canada
CANADIAN LONGYEAR LTD.
North Bay, Ontario

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS
REPRESENTATIVES IN PRINCIPAL MINING CENTERS IN THE UNITED STATES AND OTHER COUNTRIES

SAFETY LESSON #1
A STEEL CHAIN REPAIRED WITH A MALLEABLE LINK BECOMES A MALLEABLE CHAIN.
A STEEL CHAIN REPAIRED WITH LAUGHLIN'S DROP FORGED STEEL "MISSING LINKS" BECOMES STRONGER THAN BEFORE

here's why COC*

"MISSING LINKS" REPAIR CHAINS BETTER

"MISSING LINKS"	ORDINARY LINKS
MATCHED	**UNMATCHED**
Made with special dies so that each half is pressure fitted. This eliminates play between the forgings, insures perfect fit when riveted into chain. There is no strain on the rivets.	When loose fitting links are put into a chain and the load is applied, the rivets take most of the strain and tend to shear until the links set. This may later cause the link to open up under heavy load.
INTERLOCKING LUGS	**ROUND LUGS**
More costly to put in the dies, but they grip firmer and really do the work of taking the load.	Ordinary round lugs fitting into round holes don't have the holding power, tend to shear or force out under strain.

Laughlin "Missing Links" are made of carefully heat treated, high grade steel. They have features found in no other repair links, and are also supplied in an exclusive pear shaped design in sizes for 3/8" to 1 1/8" chain.

Buy From Your Local Distributor

He is in business to give you prompt, courteous service and to save you money, time and trouble. He's your one best source for industrial supplies.

FOR SAFETY'S SAKE SAY **LAUGHLIN**

THE THOMAS LAUGHLIN CO.
46 Fore St., Portland, Me.

*T. M. Reg.

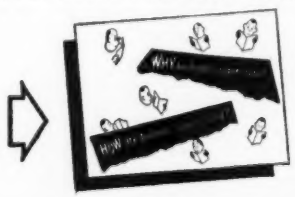
All business is specialized

. . . and nothing specializes on your business like your business paper

This profit-wise peddler looks for the wettest crowds. His business is *specialized.* Like yours.

And like your business, this business paper of yours specializes, too. It packs into one place the current facts you want. It scouts out, sorts out, reports and interprets the specific news and information you need to keep posted and keep *ahead* in your field. Cover to cover, editorials and ads, it concentrates on bringing you specialized help you can't get *anywhere* else. Read it thoroughly . . . and put it to work.

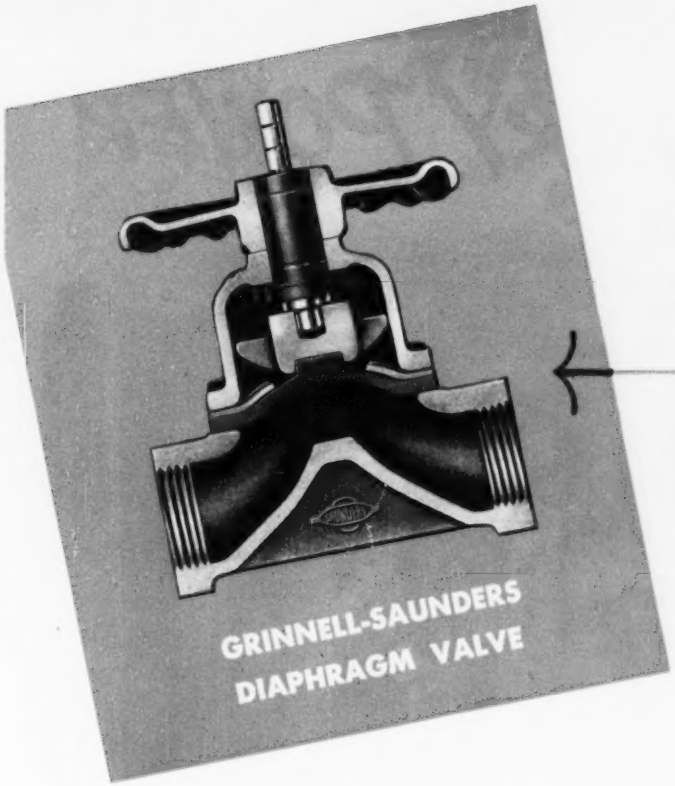
This business paper in your hand has a plus for you, because it's a member of the Associated Business Publications. It's a *paid* circulation paper that must *earn* its readership by its quality . . . And it's one of a leadership group of business papers that work together to add new values, new usefulness, new ways to make the time you give to your business paper still more profitable time.



A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet." Room 2710.

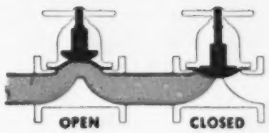
McGRAW-HILL PUBLISHING COMPANY
330 W. 42nd St., New York 36, N. Y.

One of a series of ads prepared by THE ASSOCIATED BUSINESS PUBLICATIONS



The valve originally designed to eliminate

COMPRESSED AIR LEAKS



Features which have made Grinnell-Saunders Diaphragm Valves the specified valve in many different industries:

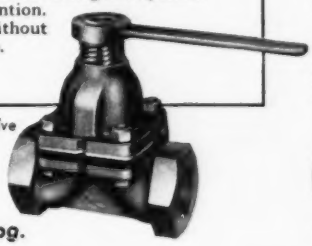
Streamlined flow. Smooth, streamlined passage, without pockets, prevents trapping of solids. Frictional resistance is at a minimum — regardless of direction of fluid flow. No disc holder in fluid stream.

Leak-tight closure against grit, scale, suspended solids. The resilient diaphragm, plus the large area of contact, gives leak-tight closure against pressure or vacuum.

Working parts absolutely isolated from fluid. Diaphragm completely seals off working parts from fluid in the line. No sticking, clogging or corroding of working parts. Valve lubricant cannot contaminate fluids.

Body, lining and diaphragm materials to meet service condition. Bodies stocked in cast iron, malleable iron, stainless steel, bronze and aluminum; other materials on special orders. Valve bodies lined with lead, glass, natural rubber or neoprene. Diaphragm materials of natural rubber or synthetics.

Minimum maintenance. No refacing or reseating is required. No packing glands to demand attention. New diaphragm can be inserted without removing valve body from the line.



Quick Operating Valve

Write for Grinnell-Saunders Diaphragm Valve Catalog.

A single 1/32-inch leak in an air valve can waste, in one month, the full cost of a Grinnell-Saunders Diaphragm Valve. In fact, that's why Grinnell-Saunders Diaphragm Valves were designed . . . to eliminate costly air leaks. Even when scale in the line becomes lodged on the valve weir, Grinnell-Saunders Valves give positive, air-tight closure.

The operating principle is simple. A rubber diaphragm, seating on metal, makes possible an absolute seal. At the same time, because working parts are wholly isolated, no packing glands are necessary, and stem leaks are impossible.

Successful on compressed air lines, it was only a matter of time before Grinnell-Saunders Diaphragm Valves were in demand for other type installations . . . handling materials as diversified as corrosive fluids, gases, beverages, foods, suspended solids . . . in lines where corrosion, abrasion, contamination, clogging, leakage and maintenance are costly factors.

Grinnell-Saunders Diaphragm Valves can be had with body, lining and diaphragm materials to meet different service conditions. Assign your next valve problem to Grinnell.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

CUT UNDERGROUND HANDLING COSTS WITH *BATTERY POWER*

To cut handling costs, you simply move more coal faster . . . with battery-powered shuttle cars. In many mines, battery cars give more ton-miles per shuttle car hour . . . travel faster . . . discharge faster . . . travel greater distances . . . travel any route . . . produce more tons per man shift . . . reduce cost per ton . . . give safety unequalled by any other type of power! Battery cars are cutting handling costs for others. Let them save money for *you*.

If you already use battery power, you need the Gould Plus-Performance Plan—a library of technical information on how to select, charge, maintain and determine the condition of your lead-acid batteries. It's free. Write Gould Battery Information Headquarters for details.

The Gould "Thirty"
America's Finest
Mine Shuttle Car Battery

GOULD *Industrial Batteries*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

he's working for you

THIS FELLOW IS TRAINED IN YOUR BUSINESS. His main duty is to travel the country — and world — penetrating the plants, laboratories and management councils . . . reporting back to you every significant innovation in technology, selling tactics, management strategy. He functions as your all-seeing, all-hearing, all-reporting business communications system.

THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it" — "they" being all the industry's front line of innovators and improvers—and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you — giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

McGRAW-HILL PUBLICATIONS

RUGGED and TOUGH

. . . of course . . . they're built by HEIL

12-yd. Heil Rock Body and Twin Telescopic Hoist used in open pit iron mine hauling.

15-yd. Heil H-60 Rock Body with telescopic hoists. Heil bodies can be individually engineered to your requirements for body length and load distribution.

Heil 15-yd. H-60 Rock Body with 70° double-acting hoist in operation on the Mesabi. Heater arrangement in floor utilizes heat of exhaust to prevent ore freezing to body.

RUGGED, rock-ready construction . . . that's just one of the Heil Rock Body features that hits the bull's eye every time for profitable operation on the toughest jobs. Heil Rock Bodies are fabricated of ¼" (or heavier) steel plate, with box-member ribs providing rigid reinforcing for maximum strength. Floor has a 2" hardwood cushion sandwiched between body bottom and wearing plate to absorb the shock of loading with big buckets. Subframe construction with both cross members and long members interlocked and welded into a single assembly prevents sagging of the body floor.

Heil hoists are fast-acting, simple and trouble-free . . . designed for heavy-duty service.

Remember, when your dump body is Heil-built, it's well-built! It stays on the job and out of the shop. It withstands the daily punishment of heavy loads . . . and comes back for more, year after year. Your Heil distributor can give you the facts about *all* Heil features. See him today!

THE HEIL CO.

DEPT. 7543, 3075 WEST MONTANA STREET, MILWAUKEE 1, WISCONSIN
Factories: Milwaukee, Wis. — Hillside, N. J.

Sales Offices: New York, Hillside, Washington, D. C., Atlanta, Cleveland, Milwaukee, Detroit, Chicago, Kansas City, Denver, Dallas, Los Angeles, Seattle; Rio de Janeiro, Brazil.

BH-8

HEILINER 13 AND 18-CU. YD. SCRAPERS

HEILINER 20-CU. YD. BOTTOM DUMP WAGON

CABLE POWER CONTROL UNITS

Prove Performance on Pilot-Plant Basis!

The cost involved in equipping and installing new manufacturing processes underlines the value of laboratory investigation and pilot-plant operation.

Nichols services provide a well-equipped laboratory, staffed by experienced engineers and technicians, qualified to perform experimental and custom roasting and the design of equipment to meet specific needs. Our laboratory is equipped with or we can make available to our clients the following pilot-plant equipment:

36" Nichols Herreshoff Multiple Hearth Furnace—For capacities up to 250 lbs. per hour.

18" Herreshoffing Unit—For small-scale batch testing, up to 30 lbs.

Portable Nerco-Niro Spray Dryer—Capable of atomizer speeds up to 50,000 R.P.M. and temperatures up to 575°F.

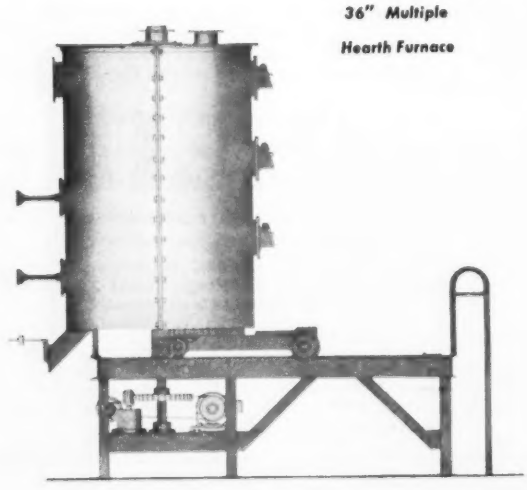
12" x 48" DWIGHT-LLOYD Sintering Machine—Capacity to 600 lbs. per hour.

Write for descriptive bulletin on Nichols Laboratory and Pilot-Plant Equipment and Services.

Nichols Engineering & Research Corp.

70 PINE ST., NEW YORK 5, N. Y.
1920 N. Meridian St., Indianapolis 2, Ind.
40 S. Los Robles Ave., Pasadena 1, Calif.
1477 Sherbrooke St. W., Montreal 2, Canada

Nichols Herreshoff 36" Multiple Hearth Furnace



How to keep informed on the "with what" part of your business

AT YOUR FINGER TIPS, issue after issue, is one of your richest veins of job information—advertising. You might call it the "with what" type—which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better—save your company money.

Each advertiser is obviously doing his level best to give you helpful information. By showing, through the advertising pages, how his product or service can benefit *you* and *your* company, he is taking *his* most efficient way toward a sale.

Add up all the advertisers and you've got a gold mine of current, on-the-job information. Yours for the reading are a wealth of data and facts on the very latest in products, services, tools . . . product developments, materials, processes, methods.

You, too, have a big stake in the advertising pages. Read them regularly, carefully to keep job-informed on the "with what" part of your business.

McGRAW-HILL PUBLICATIONS

NEW UST* Continental Idlers

*** UNIT-SEALED PRE-LUBRICATED TIMKEN BEARINGS**

Saves Grease!
Saves Labor!
Saves Belts!

CGC UNIT-SEALED
CGC PRE-LUBRICATED
CGC TIMKEN BEARINGS

Continental's Unit-Sealed "UST" Conveyor Idlers, incorporating Timken Bearings, Garlock Klozures, are the answer to the operator's prayer.

The Unit Bearing Assemblies—"sealed unto themselves" provide an ample but not excessive grease reservoir. This represents a saving of grease and further eliminates any possible migration of the grease from upper to lower bearings on inclined rolls. The lubricant is a top quality water repellent grease of a stable consistency with a wide temperature range for long life.

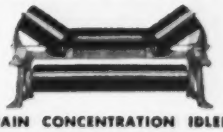
Most important—this construction permits operating the Continental "UST" Idler without relubrication for 1-2-3 years depending upon the severity or character of conditions.

For detailed information on these idlers write for Bulletin EM-116

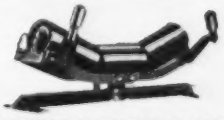
STANDARD DUTY IDLER

SELF-ALIGNING FLAT BELT IDLER

RUBBER DISC IMPACT IDLER



GRAIN CONCENTRATION IDLER



SELF-ALIGNING TROUGHING IDLER

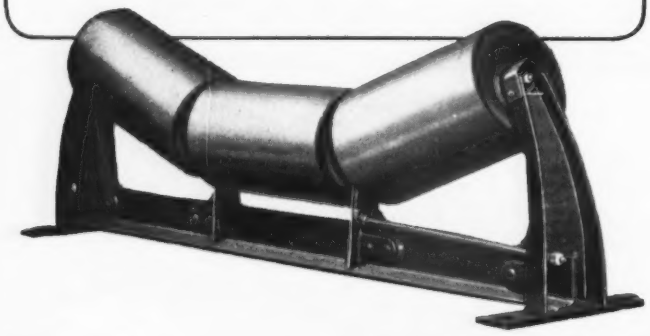
Long Life- THE ULTIMATE IN MINIMUM MAINTENANCE

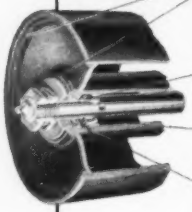
CG—5209

INDUSTRIAL DIVISION
CONTINENTAL GIN COMPANY
BIRMINGHAM, ALABAMA

ENGINEERS CGC ATLANTA • DALLAS • MEMPHIS • NEW YORK CGC MANUFACTURERS

Why LINK-BELT IDLERS require minimum lubrication and adjustment




CUTAWAY OF "100" ROLL
Concentrically counterbored and journaled full-length central tube and counterbored roll shell are continuously welded to dished heads to maintain balance and bearing alignment.
Precision roller bearings maintain alignment.
Large grease reservoir prolongs lubrication intervals.
Grease-in-dirt-out, cartridge type unit seal preserves lubricant. No springs, no loose parts, no sliding metal-to-metal contact.

BY MINIMIZING maintenance . . . holding "down-time" to a new low . . . reducing power requirements —Link-Belt Roller Bearing Idlers save you money.

And, because of standardized design, Link-Belt gives you the famous "100" Idler or the heavy-duty "200" Idler at a cost lower than you'd expect. You can choose from the full Link-Belt line of troughing, impact-cushioning, belt training and flat belt idlers in a wide range of roll diameters and belt widths. A complete line to meet any requirement.

Remember, too, Link-Belt offers a complete line of other belt conveyor components—all types and sizes of take-ups, pulleys, trippers, back-stops and drives. Coupled with our broad belt conveyor engineering experience, this assures you of the right equipment for your handling requirement.

LINK-BELT

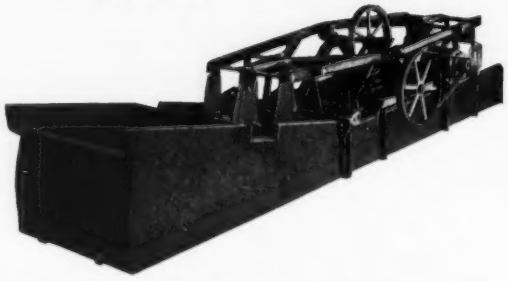
ROLLER BEARING IDLERS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in Principal Cities. 12,841

Improve Your Classification with Morse "Trueline" Classifiers

Metallurgical Efficiency

Improved Mechanical Performance



Maximum Pool Area Gives Highest Overflow Efficiency

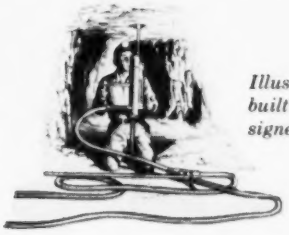
The improved simplified "Trueline" mechanisms are responsible for the popularity and repeat orders for Morse "Trueline" Classifiers. They are mechanically correct and only minimum head room is required. Maintenance expense is very low—motor drives are compact. For further details, write for Bulletin 407.

Crushing, Grinding, Flotation, Thickening and Filtering Machinery

ESTABLISHED 1898

MORSE BROS. MACHINERY CO.

P. O. BOX 1708 • DENVER, COLORADO, U.S.A. • CABLE "MORSE"



Illustrated is Thermoflex—a mandrel-built hose with extra strength, designed specifically for use in mines.

When you are in need of hose—
Suggest you look at Thermoid!

See how extra strength is built into each length—with either tough rayon cords or special cotton fabric. Abrasive resistant—light—easily handled—resists kinking—designed for maximum service. Whether it be one of Thermoid's multiple service types or a hose designed for a specific use, your Thermoid Distributor can recommend the type best suited for your particular requirements.

Call your Thermoid Distributor. He has complete information on all types of Thermoid Hose and other Thermoid products. Our experienced Sales Engineers are available for help with unusual problems.

Thermoid
Industrial Rubber Products
Quality Service

It will pay you to specify Thermoid.

Conveyor & Elevator Belting • Transmission Belting
F.H.P. & Multiple V-Belts • Wrapped & Molded Hose

Thermoid

Rubber Sheet Packings • Molded Products
Industrial Brake Linings and Friction Materials

Thermoid Company • Offices & Factories: Trenton, N. J., Nephi, Utah

Your grinding costs less with Norton wheels

For every grinding job you do, there's a Norton wheel to do it better . . . in less time . . . at lower cost. There's the right combination of abrasive, bond, grain size and structure for each application, above or below the surface. Check here:

SAVE! With Norton ALUNDUM* WHEELS for a wide range of mining needs. For sharpening high-speed steel tools and for grinding other hard, high-tensile-strength materials, they have no equal. Typical specification A30-O5VBE.

SAVE! With Norton regular 37 CRYSTOLON* WHEELS to provide top economy and efficiency for rough grinding gray iron and the non-ferrous metals. Typical specification 37C24-Q5V.

SAVE! With Norton green 39 CRYSTOLON WHEELS in the new vitrified K-bond to do the best job sharpening carbide-tipped bits and cutters. Typical specification 39C60-I8VK.

In Norton *Reinforced* Hub wheels — Types BD and BFR — resinoid bonding and nylon web reinforcing assure maximum safety and versatility. On portable grinders their uses include weld grinding and other smoothing operations; also cutting-off and notching.

Your Norton Distributor is ready to help you

Besides his own practical experience with abrasives in the mining field, he can call in the Norton Abrasive Engineer for additional expert aid in your grinding problems. Take advantage of the wide store of knowledge he makes available to you. See him for the right wheels for any grinding job. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

W-1487

NORTON
ABRASIVES

Making better products to make other products better

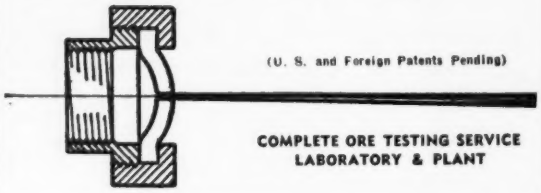
GREATER FLOTATION EFFICIENCY
Regardless of Machine Type Through Proper Pulp Density Control

A TYPICAL CASE

	TAILING	
% SOLIDS	% Pb.	% Zn
33.5	0.06	0.14
22.0	0.24	0.22

KEEP PULP DENSITY UP BY THE USE OF

BOOTH NON-CLOG SPRAY



(U. S. and Foreign Patents Pending)

COMPLETE ORE TESTING SERVICE
LABORATORY & PLANT

MINERALS SEPARATION • SERVICE • EQUIPMENT

BOOTH ENGINEERS
146 So. West Temple • Salt Lake City 1, Utah

CORE DRILLING
"We look into the Earth"

—anywhere!

- Mineral Prospecting
- Foundation Test Borings and Grouting
- Large diameter holes for Ventilation and Escapeways

PENNSYLVANIA Drilling CO.
DRILLING CONTRACTORS & MFRS.

1205 Chartiers Ave. PITTSBURGH, PA. WAlnut 1-5816

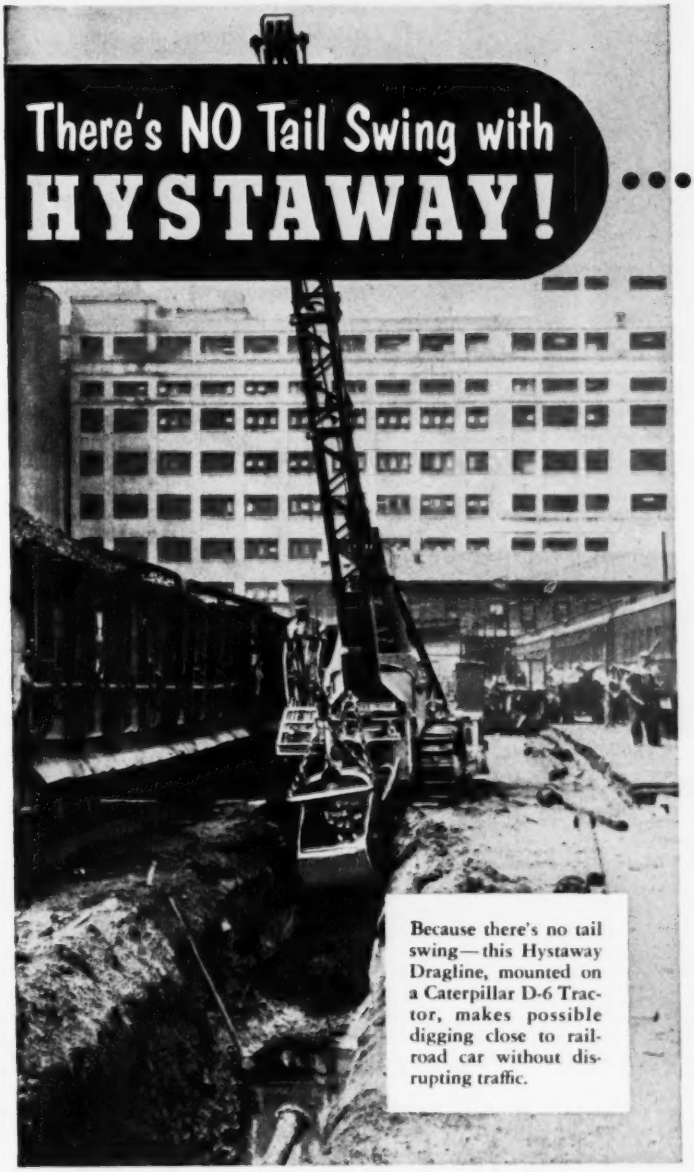
Make *BELT SPLICING*

A "ONE MAN" JOB!

With the TENNEFOS BELT SPLICER, *one man* can splice *TROUGH-TYPE*, flat drive and conveyor belts quickly . . . easily. No special tools needed . . . available in any desired width and made to fit the various trough-type rollers. Write today for full information—find out how much time, labor, money a TENNEFOS BELT SPLICER can save YOU, day after day. Drop us a card for literature, prices RIGHT NOW!

TENNEFOS MANUFACTURING CO.
Dept. E-4 Moorhead, Minnesota

There's NO Tail Swing with HYSTAWAY!



Because there's no tail swing—this Hystaway Dragline, mounted on a Caterpillar D-6 Tractor, makes possible digging close to railroad car without disrupting traffic.

... and that makes possible digging in closer quarters!

With the *Hystaway* you can dig right up against walls or other obstructions — in places where digging is impossible with shovels which must have "elbow room" to accommodate a swinging superstructure.

But whether you are digging close to obstructions—or out in open country—you always get full production with Hystaway. Only Hystaway offers: Full heavy-duty diesel tractor power; unimpeded crawler tractor mobility; mounting on *new* or *used* tractors; full production excavation and bulldozing with *one* piece of equipment... and compared to other shovels, can be used on more jobs. *Hystaway will put more profit into your operations!*

See your Caterpillar-Hyster Dealer, or write for Catalog 1235 to:

HYSTER COMPANY

2965 N. E. Clackamas St. Portland 8, Oregon

1865 N. Adams St. Peoria 1, Illinois

HYSTAWAY®

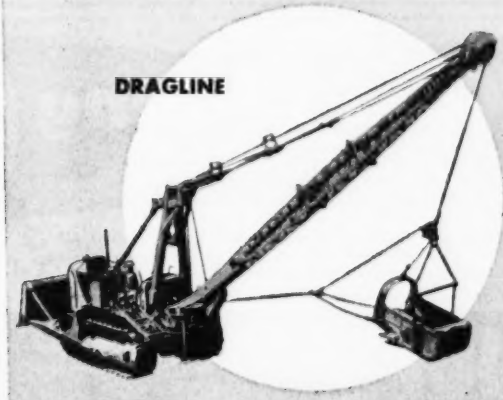
There is no "tail swing" because the boom is the *only* part that revolves.

OTHER SHOVELS

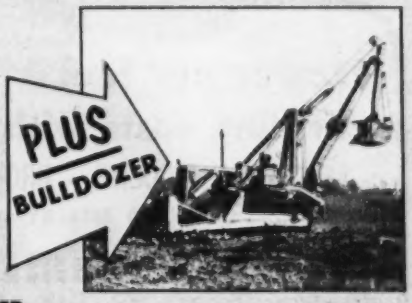
...require extra room because superstructure swings outside of track.

THERE'S PROFIT IN HYSTER POWER

ONLY HYSTAWAY OFFERS ALL THESE MACHINES IN ONE!



1. DRAGLINE
2. SHOVEL
3. BACKHOE
4. CLAMSHELL
5. CRANE
6. PILE DRIVER
7. PLUS BULLDOZER



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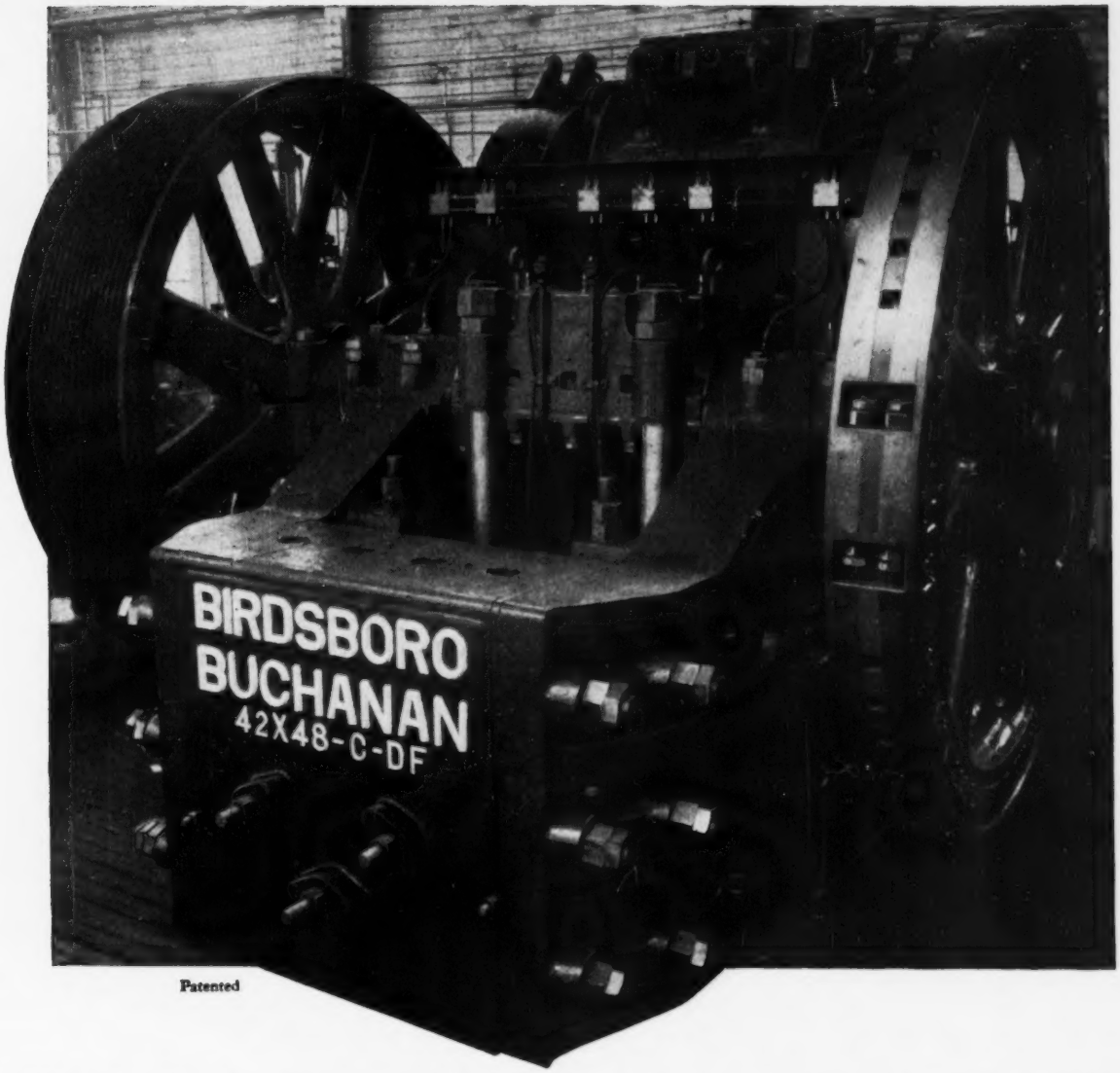

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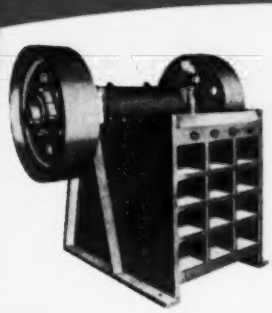

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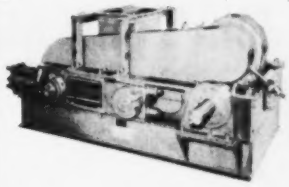

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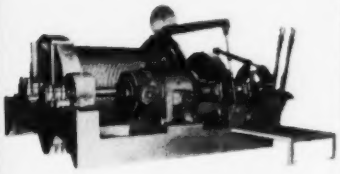

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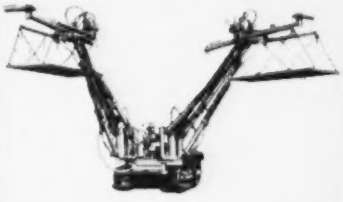

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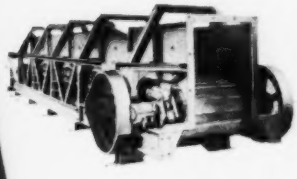

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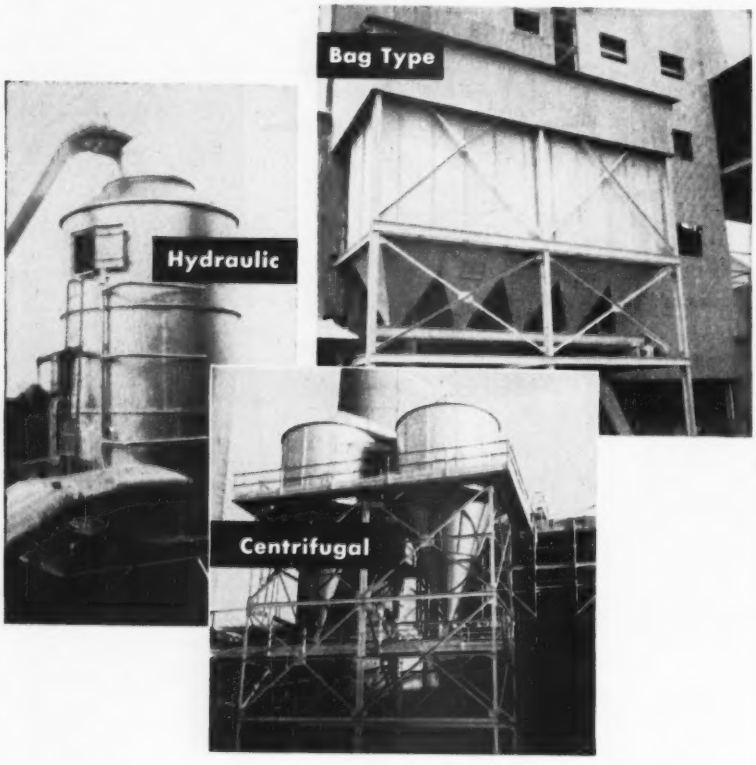

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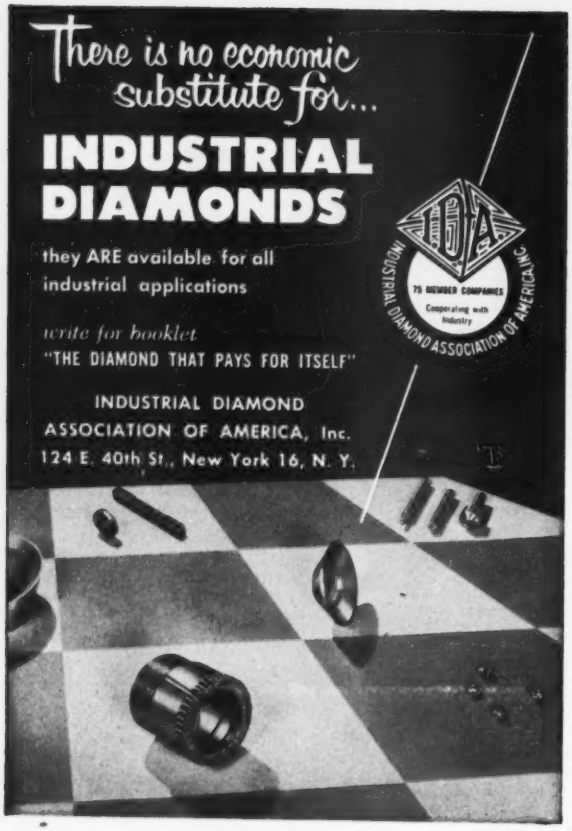
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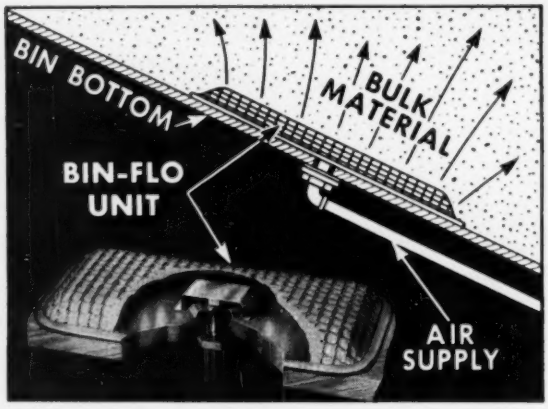

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(Continued on page 220)

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(Continued from page 218)

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1 Sullivan diamond coredrill size A hydraulic feed, 400 ft (A) rode.
2 high pressure pumps, and all necessary Tools. Rig practically new.
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1—6′ x 60′ Allis Chambers Dryer
Located at Cartersville, Ga.
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Manufactured by W. N. Best Co.
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1—4′ Single Disc Oliver Filter
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1—4′ x 6′ Morse Drum Filter
1—18″ Morse Round Pattern Filter Press
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1—#12 Sweetland Filter Press, 36 leaves.

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2—9″ x 14″ Universal, #3M
1—9″ x 15″ Wheeling
1—9″ x 15″ Farrell
1—9″ x 16″ Universal
1—8″ x 24″ Rogers
1—8″ x 36″ Universal
1—11″ x 18″ Universal
1—24″ x 13″ Farrell

FLOTATION MACHINES

1—New Morse Jetair #7 Hydra-cell
1—New Morse Jetair 2 cell #7
1—Fagregan Single Cell
1—6 cell 18″ Stearns-Roger
1—6 cell Denver "Sub A" #18
1—6 cell Denver "Sub A" #21

HOISTS—ELECTRIC

1—10 HP Vulcan #0 Single Drum
1—15 HP Morse New Single Drum
1—20 HP H&B Single Drum
1—22 HP Vulcan Single Drum #1½
1—30 HP Vulcan Single Drum
1—3 HP Vulcan Double Drum
1—3 HP Single Drum
2—52 HP Vulcan #4½ Single Drum
1—50 HP Fairbanks-Morse Single Drum
1—60 HP H&B Single Drum
1—60 HP Vulcan #23ELF Single Drum
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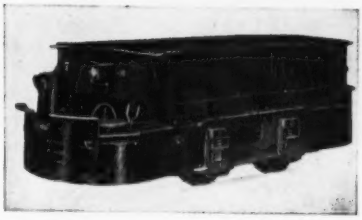
1—112 HP Vulcan Single Drum
2—150 HP Vulcan Single Drum
1—350 HP Dillon-Box Single Drum
1—600 HP Box Single Drum



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1—1½ Ton Mancha Trammer
1—2-2½ ton Whitcomb Battery, 24″ gauge
1—2½ ton Jeffrey battery or trolley, 36″ gauge
1—3½ ton Mancha battery, 25″ gauge, with 2 sets Edison batteries and charging set
1—3½ ton Mancha battery, 24″ gauge
1—4 ton Westinghouse battery, 24″ gauge
1—4 ton Ironton battery, 36″ gauge
2—7 ton General Electric permissible battery, 36″ gauge
1—7 ton Atlas battery, 36″ gauge
3—8 ton Ironton battery, 36″ gauge
2—8 ton General Electric battery, 36″ gauge
4—10 ton Atlas battery, 36″ gauge
1—4½ ton Goodman trolley, 36″ gauge
1—5 ton Jeffrey trolley, 36″ gauge
1—6 ton Goodman trolley, 36″ gauge
2—8 ton Goodman trolley, 36″ gauge

BALL & ROD MILLS

1—4′ x 4′ Standard Ball Mill
2—6′ x 48″ Hardinge Conical Ball Mills with air swept equipment.
1—8′ x 22″ Hardinge Conical Pebble Mill
1—3′ x 8′ Marcy Rod Mill

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1—48″ x 15′ Dorr Multizone Classifier
1—48″ x 18′ Akins Spiral Classifier
1—40″ x 20′ Morse Spiral Classifier

BALANCES

1—200 oz. Troemner bullion and specie balance
1—#645 Ainsworth 1 gram assay balance
1—Becker button balance, sensibility 1/50 mg.
1—Keller assay balance, inverted beam, sensibility 1/100 mg.
1—Smith & Thompson assay balance, sensibility .008 mg.
1—Thompson #7 button balance, sensibility 1/200 mg.
1—5000 oz. Fairbanks & Hutchinson bullion balance

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2—#8H 42 Jeffrey Aerodyne mine fans
8—Jeffrey Aerodyne Midget Exhausters, permissible
4—Jeffrey #61 Exhausters with 3 HP motors
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3—#250 D.F.C. Furnace Blowers
4—American Type HS New Blowers, 12000 CFM with 2 speed motors

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21—Deister "Plat-O" Tables

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Mine Hoist: 150 hp 48″ double-drum.
Headframe (steel) 3-comp. 58′ 6″.
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THE EQUIPMENT IS ALL REBUILT IN THE COMPANY'S SHOPS AND SOLD GUARANTEED IN FINE CONDITION.

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1—Angel Iron Works double drum electric hoist; 80 hp G.E. continuous duty slip ring electric motor; Cutler Hammer automatic torque brake and manually operated parallel post brakes; rope pull 8,000 lb. unbalanced; rope speed 500 ft. per minute; drum capacity 2500 ft; dental clutches; limit switches to prevent overwind; push button control; magnetic circuit breaker; fully reversible drum controller complete with grids; voltage 440, 3 phase 60 cycle. Hoist just like new.
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1—20,000 ft. or more pressure volume Sturtevant blower for tunnel or mine ventilation. 20 hp, 440 volt motor direct connected 30″ dia. outlet with steel reducer to 16″. Push button starter; all on sub-base. Practically new.
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1—Allis Chalmers 4″ x 5″ centrifugal motor pump; 50 hp, 3560 r.p.m.; capacity 500 gallons per minute; head 210 ft.; motor 50 hp, 440 volts, 60 cycle, 3 phase. Excellent condition.
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14″ belt	$16.50	24″ belt	$18.75
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All steel. Interchangeable with other well-known makes. Replaceable ball bearings. Rust proof ball races; maintenance is negligible.

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Famous brands at deep cut prices.

Width	Ply	Top Cover	Bottom Cover	Duck Canvas	Price
18″	4	1/8″	1/32″	28 oz.	2.50/ft.
24″	4	1/8″	1/32″	28 oz.	3.23/ft.
30″	4	1/8″	1/32″	28 oz.	3.97/ft.
36″	4	1/8″	1/32″	28 oz.	4.70/ft.
48″	4	1/8″	1/32″	28 oz.	6.16/ft.

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All welded steel head and tail pulleys, and assemblies complete. Priced from $60.00

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Heavy duty eccentric-shaft types; 1 to 5 decks, 3′ x 8′ to 5′x14′. Others from 2′x4′. Wire cloth or plate included to your specifications.

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TOUGHCOVERS—Heavy duty, specially compounded abrasive resistant rubber covers having high tensile strength. Thoroughly capable of withstanding the abrasive action of bulk materials. Properly vulcanized to the carcass to assure utmost performance, economically.

STRONG CARCASS—Constructed of finest quality 28 and 32 ounce tough cotton duck, properly treated and impregnated to avoid mildew from moisture and atmospheric conditions. Each ply thoroughly embedded in rubber to prevent ply separation.

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Avoid delays in your production schedules!

We carry in stock for your immediate requirements, Conveyor Belting in widths from 8 inches to 48 inches

Width	Ply	Thickness Top Cover	Thickness Bottom Cover	Type of Duck Carcass
8"	4	1/16"	1/32"	28 Oz.
10"	4	1/16"	1/32"	28 Oz.
12"	4	1/16"	1/32"	28 Oz.
14"	4	1/16"	1/32"	28 Oz.
16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
42"	5	1/8"	1/16"	32 Oz.
48"	5	1/8"	1/16"	32 Oz.
48"	8	1/8"	1/16"	32 Oz.

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ELEVATOR TRANSMISSION & V-BELTING ALSO IN STOCK.

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1—21 Cu. Yd. Steel Hopper Bin
2—18 Cu. Yd. Steel Hopper Bins with legs
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60 INCH 1—85' - 1—300'
36 INCH 1—100' - 2—250' - 1—320' - 1—400' 1—590' - 2—1000' & 1—1600' Lang.
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5 SURPLUS MERRICK E WEIGHTOMETERS
For 24", 30" 36" & 42" Belts

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DINGS MAGNETIC: Type I-R — 3 STAGE — 60"
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9 Electric 5,000, 3,865, 3,178, 2,280, 1,578 & 1,302, 1,090, 676 & 500 Ft.
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8 Goodman 4 ton — 8 ton Battery Locomotives.
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10 Eimco 40 & 12B & 21, 4 Sullivan ML2B.

MISCELLANEOUS
Rotary Dryers: 4x20, 4x45, 5x35, 6x33, & 8x47.
Kilns: 4x45, 5½ & 7x60, 8x60, 8x80 & 8x125.
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1—800, 1100 & 1500 Barrel Cement Plants—Complete lime hydrating plant
1—#4 & 5 roll Raymond mills.
Rotary Dryers—4' x 30'—6' x 40'—5' x 50'
Tube & Ball Mills—6' x 9'—5' x 22'—5½' x 20'.
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Sturtevant Rotary Ring crushers—No. 0—No. 1—No. 1½ and No. 2.
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5'—8'—10'—14' & 16' — Air separators
Magnetic separators—Jigs—screens—classifiers and thickeners and air separators.
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8' x 4'—8' x 12' Rotary Filters.
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New Dryers Kilns & Dust Collectors.
9"—10"—14"—16"—30" McCully Superior gyratory crushers.

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1—15½ x 9½ x 10 two stage duplex type HAC Horizontal Gardner-Denver Compressor, Serial No. 123374, Model H-15593-CC, with five step Class M-25cs Control for 110# Pressure with metalliz piston rod packing.
1—42" x 10' ASME NB Vertical 125# Air Receiver with fittings.
1—125 HP, 360 RPM, 440 Volts, 3 ph, 60 Cycle, AC, 8 Power Factor, 50 Degree C Rise Engine Type Synchrono Motor.
1—Full voltage magnetic starter with standard push button.
1—5KW, DC 125 Volt, 3 ph, 60 Cycle, 440 Volts, 1750 RPM, Motor Generator Set.

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Used Equipment in Excellent Condition for Immediate Delivery

1 Wemco Simplex Densifier 48" x 27' 3" with Lifting Device, Reversing Switch, Varispeed Motor and Drive.
2 Wemco Ferhope High-Power Sink and Float Wet Type Magnetic Separators Size 36" Complete with All Accessories.

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SYNCHRONOUS MOTORS

Qu.	H.P.	Make	P.F.	Volts	R.P.M.
1	6000	G.E.	100	2300	90
1	3000	Whse.	80	4800/2400	720
2	2100	G.E.	100	2300	360
2	1750	G.E.	100	2300	3600
1	750	G.E.	80	2300	450
1	600	G.E.	100	440	360
1	700	G.E.	80	2300	720
1	250	G.E.	100	2300	514
1	200	Whse.	80	440	1200
1	187	G.E.	80	440	720
1	150	G.E.	100	2200	900
1	150	G.E.	100	550	600
1	120	G.E.	80	550	450
2	135	G.E.	80	4000/2300	1200
3	125	El. Mchy.	100	4800/2400	900
1	125	G.E.	80	2200	900
2	100	Whse.	80	440	1800
1	100	Ideal	80	440	900
3	100	G.E.	80	440	600

With these we can supply—Manual, Semi or full magnetic reduced or full voltage control

SQUIRREL CAGE MOTORS

3-Phase — 60 Cycle

Qu.	H.P.	Make	Type	Volts	R.P.M.
1	400	Cont.	NZ-806	2300	1200
1	400	G.E.	I-K	2200	v514
1	400	G.E.	KT-412	2200	450
1	300	Whse.	CS-890	2300	1780
1	200	Whse.	CS-873-C	2200	1200
1	200	Al.Ch.	ARY	440	600
2	125	Al.Ch.	AR	2200	1750
1	125	Al.Ch.	AR	2300	514
1	125	C.W.	126-Q	440	430
2	100	Whse.	CS-663-C	440	1750
1	100	Al Ch.	AR	550	720
1	100	Whse.	CS-938	2200	514
1	100	F.M.	H-241	440	450
3	75	Al.Ch.	AR	2200	1705
1	75	G.E.	I-K	440	600
1	75	Al.Ch.	AR	2200	720

Special—1 (new) G.E. Vertical KF-574, 2200-Volt 580 R.P.M ..enclosed, hollow shaft.

MOTOR GENERATOR SETS

Qu.	KW	Make	RPM	Volts DC	Volts AC
1(3-U)	2400	Whse.	720	600	2400/4800
2	1500	G.E.	600	600	4150/2300
3	1000	Whse.	514	600	11000/6600
4	1000	G.E.	514	600	11000/6600
1	1000	G.E.	514	600	2300
2	500	C.W.	720	575	2300/440
1	400	C.W.	1200	125/250	440/2300
2	250	Whse.	1200	125/250	2300
1	200	Ridgway	900	275	2300
2	200	Whse.	1200	125/250	440
1	155	G.E.	720	250	2300/440
2	150	Whse.	1200	250	2300
1	100	Al. Ch.	1200	125/250	4000/2300
1	100	Delco	1200	125/250	440/220
1	100	Ridgway	1200	275	4000/2300
1	100	C.W.	1200	125	440/220
1	85	C.W.	1200	250	440/220
1	75	Al. Ch	900	250	2300
1	75	Whse.	900	75	2300
1	25	Ideal	1750	125	220
1	25	Al. Ch.	1200	250	440/220

We can furnish any of these sets with exciters and VARIABLE VOLTAGE CONTROLS engineered and rebuilt to your requirements.

Motor Generators of modern design, complete with control—still on their original foundations—available for immediate shipment.
(3)—G. E. 1500-KW, 250-VDC, 514 R.P.M., opd., interpole, pole face windings, 2100-HP syn. motors, .8-PF, 13,200-V, 3-p, 60-cy, will reconnect to 6600-V. or 4160-V.

TRANSFORMERS

Qu.	KVA	Make	Type	Phase	Voltage
3	833	Whse	OISC	1	66000/59400-2300/4160
1	2750	G.E.	H	3	13,800-2400/4160Y
3	250	Packard	A	1	13,200-2200
3	150	Packard	A	1	2300-230/460
3	100	G.E	H	1	33,000-2300
3	25	G.E	H	1	2400-120/240
40(new)	3	Al. Ch.	OISC	1	2400-120/240

SLIP RING MOTORS—CONSTANT DUTY

3-Phase — 60 Cycle

Qu.	H.P.	Make	Type	Volts	R.P.M.
1	1800	G.E.	MT 498	2300	327
1	1200	G.E.	MT 38	2200	277
2	1000	Al.Ch.	ANY	2200	238
1	800	G.E.	MT	2200	440
1	700	Whse.	CW	2300	720
1	600	G.E.	MT 20	2300	360
1	500	Al.Ch.	ANY	2200	514
2	500	G.E.	I-16-M	2300	450
1	400	G.E.	MT 412	2200	440
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4***	800	Whse.	Encl. (Rev.)	600
1	350	G.E.	CD-169-A	1150
1	200/250	El. Dy.	No. 22	400/1200
1	250	G.E.	MPC	325/975
1***	200	G.E.	MPC	500/1200
1	200	Whse.	Mill	300/1200
1	180	G.E.	MPC	400
1***	125	Whse.	SK-190	600
2	125	Whse.	SK-184	575/880
1	90/160	G.E.	MPC	625/1125
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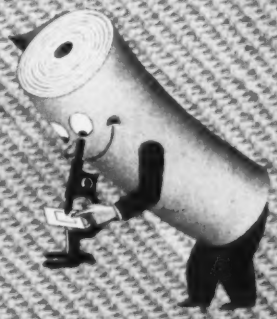

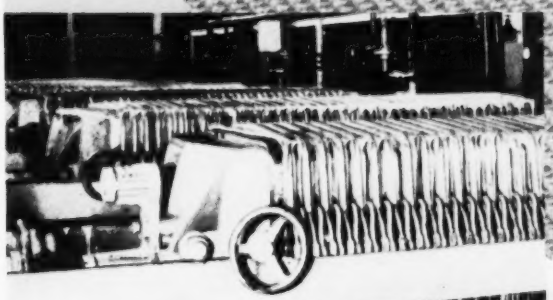

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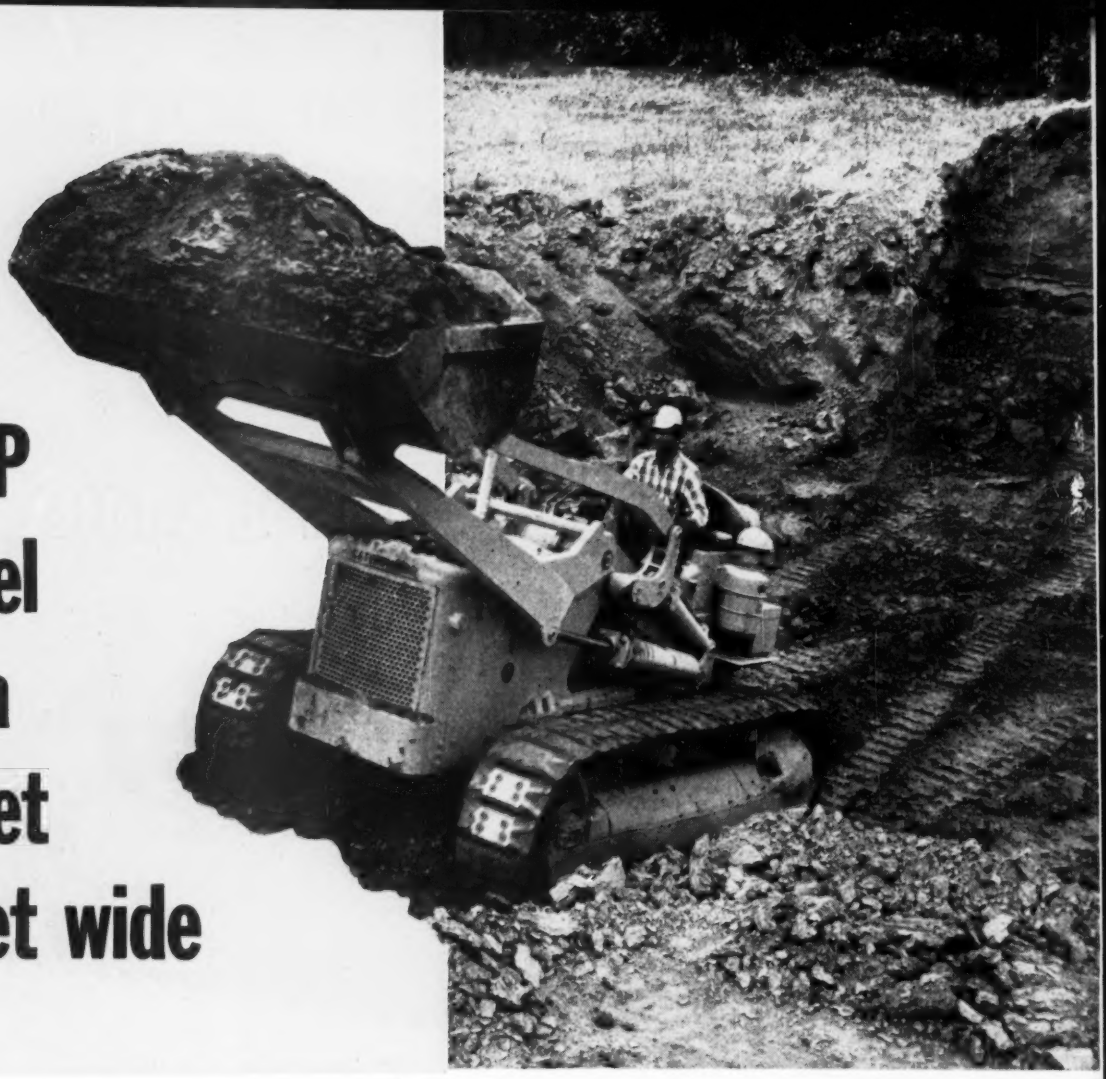
New CAT* 66 HP Shovel has a bucket 8 feet wide



This is the new Caterpillar No. 6 Shovel. A glutton for work around any kind of mining job, on the surface or underground, it strips, excavates, cleans up, stockpiles, loads, 'dozes and handles haul road maintenance. Here, take a close look:

The shovel frame and tractor are welded and bolted together. This is *one* unit – big, tough and completely Caterpillar built.

That bucket is 96 in. across, scoops up 2 cu. yd. easily, and has 66 HP behind its hard-faced cutting edge of high-carbon steel. There's a 35° automatic tip-back which holds the load in the bucket, and a 50° dump angle, with impact shaking, to get rid of even the stickiest material quickly and cleanly.

The bucket is wider than the widest part of the tractor. You can work close to walls, and cut sidewalls clean, with this shovel.

Those crawler tracks are extra long and designed especially for this unit. They're non-oscillating, too, for added stability and finer grading.

The Caterpillar-built hydraulic system lets the operator raise and dump at the same time and features an automatic kick-out. And the operator sits high and clear, with excellent visibility of the bucket's sides, back and corners. Yet the unit's over-all height (6 ft. 11 in.) is low enough for working in tight places and low overhead areas.

Your Caterpillar Dealer is anxious to demonstrate the No. 6 Shovel for you. Give him a call.

Caterpillar Tractor Co., Peoria, Illinois.

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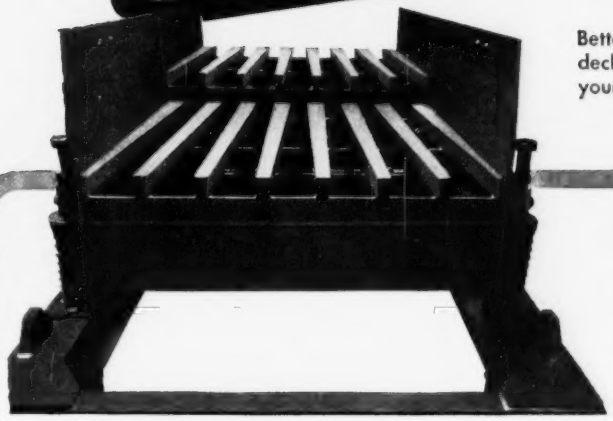

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Better results in scalping with these special decks . . . designed to S-T-A-Y C-L-E-A-R on your heavy duty jobs.

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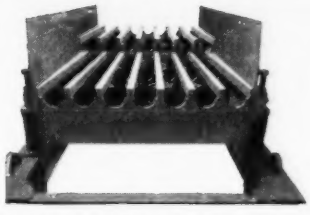
(for openings 1 to 3 in.)

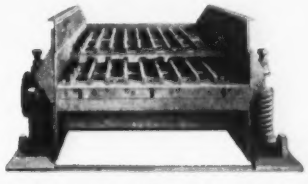
Longitudinal openings between grizzly bars stay clear because bars provide flared openings. Step deck turns material over, dumping fines from large pieces. Each bar is tapered from back to front and from top to bottom for additional freedom from plugging. Handles feed sizes up to 30 in. diameter.



Straight Grizzly Bar Deck

(for openings 4 to 10 in.)

For run-of-mine screen as shown above for use with straight instead of tapered grizzly bars. Openings between bars are flared from back to front for free material discharge. Handles feed in excess of 1000 tph in sizes up to 3 ft.



Steel Plate Deck with Skid Bars

(for openings 3 to 10 in.)

For run-of-mine scalping where positive scalping is desired. Steel plate decks with skid bars may be obtained with or without step deck construction. Plate deck is bolted to screen body and can be removed easily.

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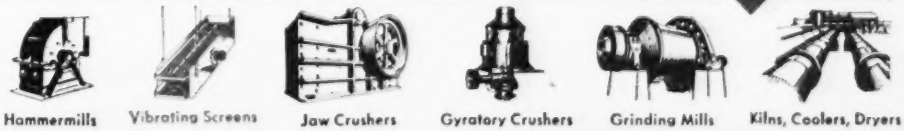

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6½-ton shuttle car rolls, steers and drives on TIMKEN® bearings

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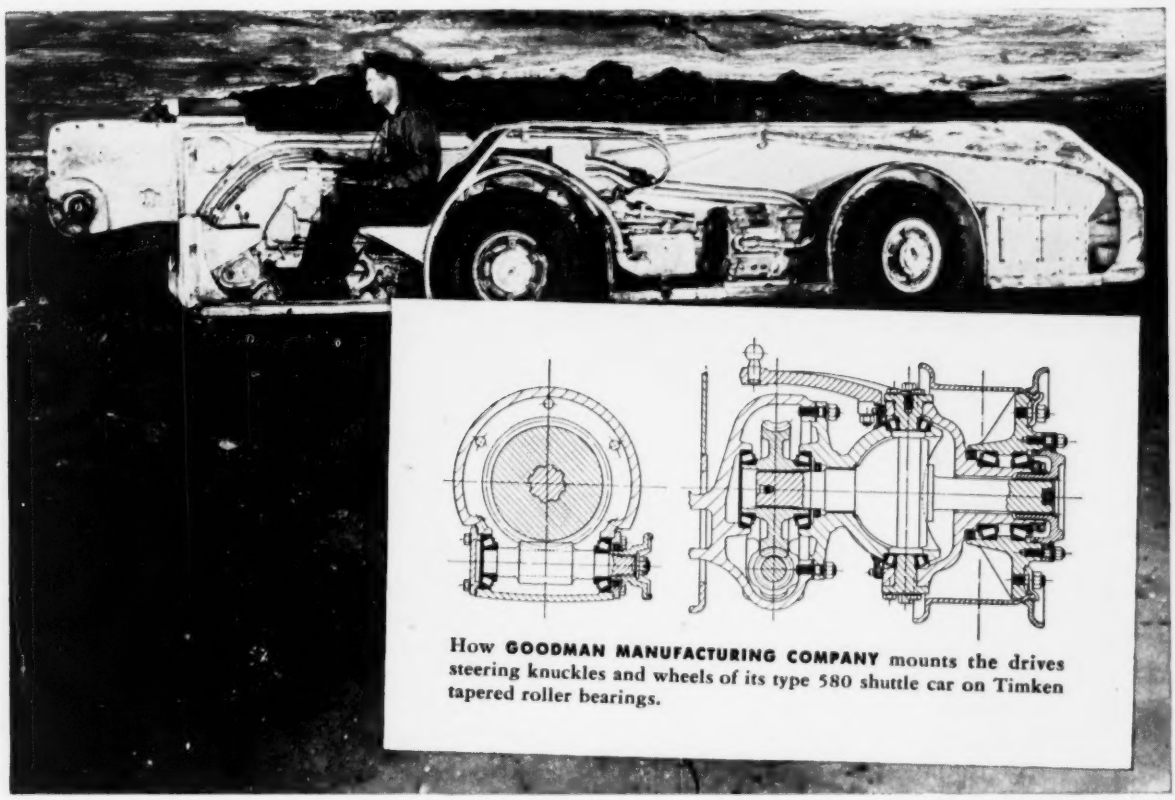
Timken bearings on the drives and steering knuckles carry both radial and thrust loads, holding shafts in proper alignment. Drive gears mesh smoothly and accurately, gear wear minimized. Wheels roll easily, effortlessly. And steering's easier, reducing operator fatigue.

Line contact between the rollers and races of Timken bearings provides more than enough capacity for the heavy loads. True rolling motion and incredibly smooth surface finish of Timken bearings reduce friction, reduce wear.

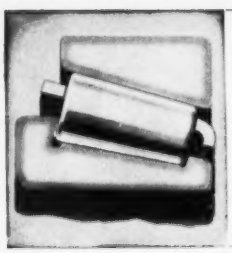
Because they hold shafts and housings concentric, Timken bearings make closures more effective. Dirt, coal dust and moisture are kept out, lubricant kept in. Maintenance costs reduced.

No other bearing can offer you all the advantages of Timken bearings. Be sure to specify them for the machines you build or buy. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **GOODMAN MANUFACTURING COMPANY** mounts the drives steering knuckles and wheels of its type 580 shuttle car on Timken tapered roller bearings.



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Because the load is carried on the *line* of contact between rollers and races, Timken bearings carry greater loads, hold shafts in line, wear longer.

The Timken Roller Bearing Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

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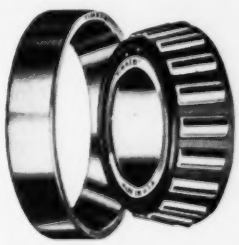

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